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
                                         Day Mins
                                                    Eve Mins Night Mins
                                                                           Intl Mins
                        VMail Message
                                            265.1
                                                       197.4
                                                                    244.7
                                                                                 10.0
     0
                    128
                                     25
     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
                                                                  45.07
                                                                                 99
                      1
                             0
                                         0
     1
                      1
                             0
                                         0
                                                      1
                                                                  27.47
                                                                                103
     2
                      0
                                         0
                                                      0
                                                                  41.38
                             0
                                                        •••
                                                                                110
                      2
     3
                             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
                                                                      2.70
                                                                                KS
                                                           3
                                                                      3.70
             16.62
                              103
                                          11.45
                                                           3
     1
                                                                                OH
     2
             10.30
                             104
                                           7.32
                                                           5
                                                                      3.29
                                                                                NJ
              5.26
                                                           7
     3
                              89
                                           8.86
                                                                      1.78
                                                                                OH
             12.61
                             121
                                           8.41
                                                           3
                                                                      2.73
                                                                                OK
       Area Code
                      Phone
     0
             415
                   382-4657
```

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 = __
       \hookrightarrow 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,
              0.949343341).
       '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))
```

support

recall f1-score

precision

```
accuracy
                                             0.93
                                                        667
        macro avg
                                             0.86
                         0.87
                                   0.85
                                                        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))
                                recall f1-score
                   precision
                                                    support
                0
                         0.96
                                   0.98
                                             0.97
                                                        572
                        0.85
                                   0.77
                1
                                             0.81
                                                         95
                                             0.95
                                                        667
         accuracy
```

0

1

0.96

0.79

0.97

0.74

0.96

0.76

572

95

```
0.95
                                   0.95
                                             0.95
     weighted avg
                                                        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
```

0.91

macro avg

0.87

0.89

667

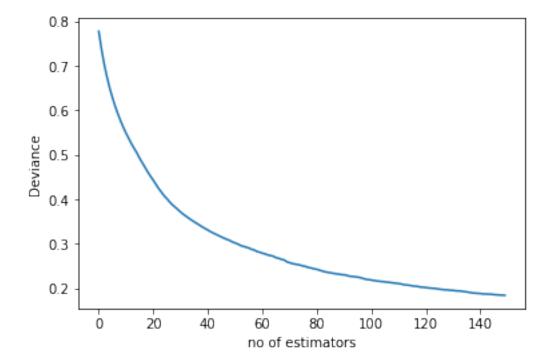
```
[34]: | gbc = GradientBoostingClassifier(learning_rate=0.05, max_depth=4,__
        \hookrightarrown_estimators=150,
                                      random_state=1)
```

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

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

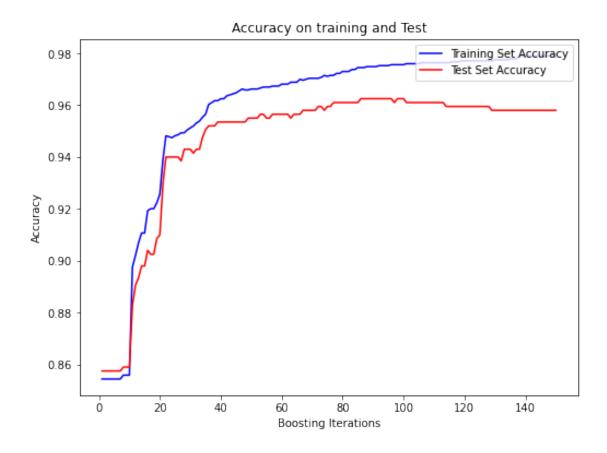
```
[37]: plt.plot(gbc.train_score_)
      plt.ylabel("Deviance")
      plt.xlabel("no of estimators")
```

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



```
[40]: gbc = GradientBoostingClassifier(learning_rate=0.05, max_depth=4, on_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
                                             0.96
                                                         667
         accuracy
                                   0.89
                                             0.92
                                                         667
        macro avg
                         0.95
                                             0.96
     weighted avg
                         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,__
       \rightarrowy test)],
              eval_metric = ['logloss', 'error'])
                                              validation_0-error:0.07277
     [0]
             validation 0-logloss:0.62188
     validation_1-logloss:0.62394
                                      validation_1-error:0.08546
             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
             validation_0-logloss:0.47256
     [3]
                                              validation_0-error:0.05851
     validation_1-logloss:0.47799
                                      validation_1-error:0.06897
             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
             validation_0-logloss:0.37993
                                              validation_0-error:0.05664
     validation_1-logloss:0.38928
                                      validation 1-error:0.07046
             validation_0-logloss:0.35691
                                              validation_0-error:0.05664
     [7]
```

```
validation_1-logloss:0.36640
                                 validation_1-error:0.07046
        validation_0-logloss:0.33442
                                         validation_0-error:0.05626
[8]
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
        validation 0-logloss:0.29682
                                         validation 0-error:0.05664
[10]
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
                                         validation_0-error:0.05026
        validation_0-logloss:0.26661
[12]
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
        validation_0-logloss:0.24311
                                         validation_0-error:0.04389
[14]
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
Γ17]
        validation 0-logloss:0.21588
                                         validation 0-error:0.04013
validation 1-logloss:0.22683
                                 validation 1-error:0.04648
        validation 0-logloss:0.20914
                                         validation 0-error:0.03826
[18]
validation_1-logloss:0.22003
                                 validation 1-error:0.04648
        validation_0-logloss:0.20245
                                         validation_0-error:0.03713
[19]
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
        validation_0-logloss:0.19040
[21]
                                         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
        validation 0-logloss:0.17340
[25]
                                         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
        validation_0-logloss:0.16617
                                         validation 0-error:0.03488
[27]
validation_1-logloss:0.17803
                                 validation_1-error:0.03598
        validation_0-logloss:0.16327
                                         validation_0-error:0.03413
[28]
validation_1-logloss:0.17492
                                 validation_1-error:0.03598
        validation_0-logloss:0.16052
                                         validation_0-error:0.03376
[29]
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
        validation_0-logloss:0.15155
                                         validation_0-error:0.03188
[33]
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
                                         validation_0-error:0.03226
[36]
        validation_0-logloss:0.14678
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
        validation_0-logloss:0.14368
                                         validation_0-error:0.03151
[38]
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
Γ417
        validation 0-logloss:0.14042
                                         validation 0-error:0.03076
validation 1-logloss:0.15443
                                 validation 1-error:0.03448
        validation 0-logloss:0.13902
                                         validation 0-error:0.03076
[42]
validation_1-logloss:0.15348
                                 validation_1-error:0.03448
        validation_0-logloss:0.13758
                                         validation_0-error:0.03076
[43]
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
        validation_0-logloss:0.13546
[45]
                                         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
        validation 0-logloss:0.13177
[49]
                                         validation 0-error:0.02963
validation 1-logloss:0.15174
                                 validation 1-error:0.03598
        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
        validation_0-logloss:0.51301
                                         validation_0-error:0.06489
[2]
validation_1-logloss:0.51596
                                 validation_1-error:0.07796
        validation_0-logloss:0.47137
                                         validation_0-error:0.05476
[3]
validation_1-logloss:0.47555
                                 validation_1-error:0.05997
        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
        validation_0-logloss:0.37836
                                         validation_0-error:0.05326
[6]
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
        validation 0-logloss:0.33367
                                         validation 0-error:0.05251
validation 1-logloss:0.34079
                                 validation 1-error:0.05697
        validation_0-logloss:0.31474
[9]
                                         validation 0-error:0.05251
validation 1-logloss:0.32185
                                 validation 1-error:0.05547
                                         validation_0-error:0.05214
        validation_0-logloss:0.29648
[10]
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
        validation_0-logloss:0.26654
                                         validation_0-error:0.05139
[12]
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
        validation_0-logloss:0.24327
                                         validation_0-error:0.04876
validation 1-logloss:0.25264
                                 validation 1-error:0.05097
Γ15]
        validation 0-logloss:0.23381
                                         validation 0-error:0.04013
validation 1-logloss:0.24341
                                 validation 1-error:0.04648
        validation 0-logloss:0.22515
                                         validation 0-error:0.04239
[16]
validation_1-logloss:0.23544
                                 validation 1-error:0.05247
        validation_0-logloss:0.21706
                                         validation_0-error:0.04126
[17]
validation_1-logloss:0.22859
                                 validation_1-error:0.05397
        validation_0-logloss:0.20897
                                         validation_0-error:0.04088
[18]
validation_1-logloss:0.21887
                                 validation_1-error:0.04947
        validation_0-logloss:0.20263
                                         validation_0-error:0.03901
[19]
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
        validation_0-logloss:0.19088
[21]
                                         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
        validation 0-logloss:0.18158
[23]
                                         validation 0-error:0.03751
                                 validation_1-error:0.04648
validation 1-logloss:0.19022
Γ241
        validation_0-logloss:0.17793
                                         validation 0-error:0.03751
validation_1-logloss:0.18732
                                 validation_1-error:0.04498
        validation_0-logloss:0.17408
                                         validation 0-error:0.03713
[25]
validation_1-logloss:0.18323
                                 validation_1-error:0.04498
        validation_0-logloss:0.17114
[26]
                                         validation_0-error:0.03676
validation_1-logloss:0.18122
                                 validation_1-error:0.04498
        validation_0-logloss:0.16809
                                         validation_0-error:0.03563
[27]
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
        validation_0-logloss:0.16052
                                         validation_0-error:0.03563
[30]
validation_1-logloss:0.17105
                                validation_1-error:0.04348
        validation 0-logloss:0.15768
                                         validation 0-error:0.03488
[31]
validation 1-logloss:0.16930
                                validation 1-error:0.04348
        validation 0-logloss:0.15564
                                         validation 0-error:0.03451
[32]
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
        validation_0-logloss:0.15238
                                         validation_0-error:0.03563
validation_1-logloss:0.16500
                                validation_1-error:0.04348
        validation_0-logloss:0.15101
                                         validation_0-error:0.03526
[35]
validation_1-logloss:0.16421
                                validation_1-error:0.04348
        validation_0-logloss:0.14999
                                        validation 0-error:0.03526
validation_1-logloss:0.16366
                                validation_1-error:0.04198
        validation_0-logloss:0.14845
                                         validation_0-error:0.03563
[37]
validation_1-logloss:0.16288
                                validation_1-error:0.04348
        validation_0-logloss:0.14710
                                        validation_0-error:0.03413
[38]
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
        validation 0-logloss:0.14383
[40]
                                         validation 0-error:0.03338
validation_1-logloss:0.16135
                                validation 1-error:0.04498
        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:
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)
        validation_0-logloss:0.14187
                                         validation_0-error:0.03376
[42]
validation 1-logloss:0.16082
                                validation 1-error:0.04498
        validation_0-logloss:0.14052
                                        validation_0-error:0.03338
[43]
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
        validation_0-logloss:0.13493
                                         validation_0-error:0.03263
[48]
validation_1-logloss:0.15847
                                 validation 1-error:0.04348
        validation 0-logloss:0.13440
                                         validation 0-error:0.03263
Γ497
validation 1-logloss:0.15830
                                 validation 1-error:0.04348
        validation 0-logloss:0.62126
                                         validation 0-error:0.07014
validation_1-logloss:0.62301
                                 validation 1-error:0.08696
        validation_0-logloss:0.56249
                                         validation 0-error:0.06864
                                 validation_1-error:0.07946
validation_1-logloss:0.56531
[2]
        validation_0-logloss:0.51301
                                         validation_0-error:0.06639
validation_1-logloss:0.51618
                                 validation_1-error:0.08246
        validation_0-logloss:0.47133
                                         validation_0-error:0.06639
validation_1-logloss:0.47532
                                 validation_1-error:0.08246
        validation_0-logloss:0.43432
[4]
                                         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
                                         validation_0-error:0.05551
[6]
        validation_0-logloss:0.37547
validation 1-logloss:0.38175
                                 validation 1-error:0.06897
        validation_0-logloss:0.35059
                                         validation 0-error:0.04914
validation 1-logloss:0.35796
                                 validation 1-error:0.06297
        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
        validation_0-logloss:0.29335
[10]
                                         validation_0-error:0.04614
validation_1-logloss:0.30327
                                 validation_1-error:0.05847
        validation_0-logloss:0.27779
                                         validation_0-error:0.04426
[11]
validation_1-logloss:0.28834
                                 validation_1-error:0.05547
[12]
        validation_0-logloss:0.26348
                                         validation_0-error:0.04389
                                 validation_1-error:0.05547
validation_1-logloss:0.27317
[13]
        validation_0-logloss:0.25116
                                         validation_0-error:0.04314
validation_1-logloss:0.26218
                                 validation 1-error:0.05697
        validation 0-logloss:0.24026
                                         validation 0-error:0.04201
validation_1-logloss:0.25123
                                 validation 1-error:0.05847
        validation 0-logloss:0.23030
                                         validation 0-error:0.04088
[15]
validation_1-logloss:0.24278
                                 validation 1-error:0.05847
        validation_0-logloss:0.22143
                                         validation_0-error:0.04088
[16]
validation_1-logloss:0.23425
                                 validation 1-error:0.05997
        validation_0-logloss:0.21347
                                         validation_0-error:0.03976
[17]
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
        validation_0-logloss:0.19984
[19]
                                         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
        validation_0-logloss:0.18424
                                         validation_0-error:0.03563
[22]
validation 1-logloss:0.19886
                                 validation 1-error:0.05397
        validation 0-logloss:0.17949
                                         validation 0-error:0.03526
Γ231
validation 1-logloss:0.19336
                                 validation 1-error:0.05247
        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-error:0.04798
validation_1-logloss:0.18562
        validation_0-logloss:0.16821
                                         validation_0-error:0.03338
[26]
validation_1-logloss:0.18305
                                 validation_1-error:0.04798
        validation_0-logloss:0.16490
                                         validation_0-error:0.03301
[27]
validation_1-logloss:0.17909
                                 validation 1-error:0.04498
        validation_0-logloss:0.16184
[28]
                                         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
        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
        validation_0-logloss:0.14961
                                         validation_0-error:0.03113
[34]
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
        validation 0-logloss:0.14301
                                         validation 0-error:0.03001
validation 1-logloss:0.16051
                                 validation 1-error:0.04348
        validation 0-logloss:0.14196
                                         validation 0-error:0.03038
[39]
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
        validation_0-logloss:0.14000
                                         validation_0-error:0.03038
[41]
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
        validation_0-logloss:0.13745
[43]
                                         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
        validation_0-logloss:0.13406
                                         validation_0-error:0.02888
[46]
validation_1-logloss:0.15404
                                 validation 1-error:0.04348
        validation 0-logloss:0.13299
                                         validation 0-error:0.02851
[47]
validation 1-logloss:0.15399
                                 validation 1-error:0.04348
        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-error:0.04348
validation_1-logloss:0.15302
        validation_0-logloss:0.62077
                                         validation_0-error:0.07127
[0]
validation_1-logloss:0.62326
                                 validation_1-error:0.09145
        validation_0-logloss:0.56152
                                         validation_0-error:0.07089
[1]
validation_1-logloss:0.56583
                                 validation 1-error:0.08846
        validation_0-logloss:0.51231
[2]
                                         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
        validation 0-logloss:0.40339
                                         validation 0-error:0.07089
validation 1-logloss:0.41329
                                 validation 1-error:0.09145
        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
        validation_0-logloss:0.33127
                                         validation_0-error:0.05664
[8]
validation_1-logloss:0.34306
                                 validation_1-error:0.07346
        validation_0-logloss:0.31199
[9]
                                         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
        validation_0-logloss:0.27772
[11]
                                         validation_0-error:0.05364
validation 1-logloss:0.29066
                                 validation 1-error:0.06897
        validation 0-logloss:0.26394
                                         validation 0-error:0.05176
validation 1-logloss:0.27842
                                 validation 1-error:0.06897
        validation 0-logloss:0.25181
                                         validation 0-error:0.04876
[13]
validation_1-logloss:0.26658
                                 validation 1-error:0.06147
        validation_0-logloss:0.24123
                                         validation_0-error:0.04426
[14]
validation_1-logloss:0.25701
                                 validation 1-error:0.06297
        validation_0-logloss:0.23183
                                         validation_0-error:0.04351
[15]
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
        validation_0-logloss:0.21552
[17]
                                         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
        validation 0-logloss:0.19236
                                         validation 0-error:0.04126
[21]
validation 1-logloss:0.21222
                                validation 1-error:0.05547
        validation 0-logloss:0.18793
                                         validation 0-error:0.04013
validation_1-logloss:0.20875
                                 validation 1-error:0.05547
        validation_0-logloss:0.18387
                                         validation 0-error:0.03976
[23]
validation_1-logloss:0.20431
                                validation_1-error:0.05247
        validation_0-logloss:0.17978
                                         validation_0-error:0.03976
[24]
validation_1-logloss:0.20091
                                validation_1-error:0.05247
        validation_0-logloss:0.17595
                                         validation_0-error:0.03864
[25]
                                validation_1-error:0.05247
validation 1-logloss:0.19795
        validation_0-logloss:0.17203
[26]
                                         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
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:0.16894
                                        validation_0-error:0.03676
validation_1-logloss:0.19116
                                validation_1-error:0.05097
        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
        validation 0-logloss:0.16120
[30]
                                         validation 0-error:0.03601
validation 1-logloss:0.18193
                                validation_1-error:0.04798
        validation_0-logloss:0.15879
                                         validation 0-error:0.03601
[31]
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
        validation_0-logloss:0.15479
                                         validation_0-error:0.03563
[33]
validation_1-logloss:0.17737
                                validation_1-error:0.04798
        validation_0-logloss:0.15329
                                         validation_0-error:0.03488
[34]
validation_1-logloss:0.17698
                                validation_1-error:0.04798
        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
Γ401
        validation_0-logloss:0.14499
                                         validation_0-error:0.03376
validation 1-logloss:0.17234
                                 validation 1-error:0.04798
                                         validation_0-error:0.03376
        validation_0-logloss:0.14402
[41]
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
        validation_0-logloss:0.14204
                                         validation_0-error:0.03338
[43]
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
Γ461
        validation 0-logloss:0.13900
                                         validation 0-error:0.03226
validation 1-logloss:0.17083
                                 validation 1-error:0.04798
        validation 0-logloss:0.13820
                                         validation 0-error:0.03151
[47]
validation_1-logloss:0.17008
                                 validation 1-error:0.04648
        validation_0-logloss:0.13763
                                         validation_0-error:0.03113
[48]
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
        validation_0-logloss:0.62173
                                         validation_0-error:0.07277
[0]
validation_1-logloss:0.62358
                                 validation 1-error:0.08995
        validation_0-logloss:0.56311
                                         validation_0-error:0.05664
validation_1-logloss:0.56579
                                 validation_1-error:0.06597
        validation_0-logloss:0.51379
[2]
                                         validation_0-error:0.06977
validation_1-logloss:0.51841
                                 validation_1-error:0.08846
        validation_0-logloss:0.47240
                                         validation_0-error:0.05664
[3]
validation 1-logloss:0.47782
                                 validation 1-error:0.06597
        validation 0-logloss:0.43691
[4]
                                         validation 0-error:0.05664
validation 1-logloss:0.44378
                                 validation 1-error:0.06597
        validation_0-logloss:0.40649
                                         validation 0-error:0.05626
validation_1-logloss:0.41349
                                 validation_1-error:0.06597
        validation_0-logloss:0.37956
                                         validation 0-error:0.05626
[6]
validation_1-logloss:0.38714
                                 validation_1-error:0.06597
        validation_0-logloss:0.35396
                                         validation_0-error:0.05514
[7]
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
        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
        validation 0-logloss:0.25365
                                         validation 0-error:0.04276
[13]
validation 1-logloss:0.26489
                                 validation 1-error:0.05547
Γ14]
        validation_0-logloss:0.24251
                                         validation 0-error:0.04314
validation 1-logloss:0.25425
                                 validation 1-error:0.05697
                                         validation_0-error:0.04276
[15]
        validation_0-logloss:0.23283
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
        validation_0-logloss:0.21600
                                         validation_0-error:0.04314
[17]
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
        validation 0-logloss:0.19081
                                         validation 0-error:0.03751
[21]
validation_1-logloss:0.20392
                                 validation 1-error:0.04947
        validation_0-logloss:0.18632
                                         validation_0-error:0.03751
[22]
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
        validation_0-logloss:0.17813
                                         validation_0-error:0.03638
[24]
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
        validation_0-logloss:0.17061
                                         validation_0-error:0.03676
[26]
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
        validation 0-logloss:0.16436
[28]
                                         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
        validation_0-logloss:0.15988
                                         validation 0-error:0.03601
[30]
validation_1-logloss:0.17708
                                 validation_1-error:0.04947
        validation_0-logloss:0.15748
                                         validation_0-error:0.03563
[31]
validation_1-logloss:0.17478
                                 validation_1-error:0.04947
        validation_0-logloss:0.15602
                                         validation_0-error:0.03563
[32]
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
        validation_0-logloss:0.14993
                                         validation_0-error:0.03451
[36]
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
                                         validation_0-error:0.03376
[39]
        validation_0-logloss:0.14562
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
        validation_0-logloss:0.14359
                                         validation_0-error:0.03376
[41]
                                 validation_1-error:0.04648
validation_1-logloss:0.16471
[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
Γ441
        validation 0-logloss:0.14095
                                         validation 0-error:0.03338
validation 1-logloss:0.16462
                                 validation 1-error:0.04648
        validation 0-logloss:0.14033
                                         validation 0-error:0.03338
[45]
validation_1-logloss:0.16451
                                 validation_1-error:0.04648
        validation_0-logloss:0.13959
                                         validation_0-error:0.03301
[46]
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
        validation_0-logloss:0.13683
                                         validation_0-error:0.03301
[48]
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
        validation_0-logloss:0.56324
                                         validation_0-error:0.05889
[1]
validation 1-logloss:0.56659
                                 validation 1-error:0.06897
        validation 0-logloss:0.51397
[2]
                                         validation 0-error:0.06977
validation 1-logloss:0.51860
                                 validation 1-error:0.08846
        validation_0-logloss:0.47256
                                         validation 0-error:0.05851
validation_1-logloss:0.47799
                                 validation_1-error:0.06897
        validation_0-logloss:0.43700
                                         validation 0-error:0.05851
[4]
validation_1-logloss:0.44342
                                 validation_1-error:0.06897
        validation_0-logloss:0.40644
                                         validation_0-error:0.05664
[5]
validation_1-logloss:0.41402
                                 validation_1-error:0.07046
        validation_0-logloss:0.37993
                                         validation_0-error:0.05664
[6]
validation_1-logloss:0.38928
                                 validation_1-error:0.07046
        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
        validation_0-logloss:0.31471
                                         validation_0-error:0.05439
[9]
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
        validation 0-logloss:0.28067
                                         validation 0-error:0.05289
[11]
validation 1-logloss:0.29058
                                 validation 1-error:0.06447
Γ12]
        validation_0-logloss:0.26661
                                         validation 0-error:0.05026
validation 1-logloss:0.27738
                                 validation 1-error:0.05997
                                         validation_0-error:0.04576
[13]
        validation_0-logloss:0.25407
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
        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
Г187
        validation 0-logloss:0.20914
                                         validation 0-error:0.03826
validation 1-logloss:0.22003
                                 validation 1-error:0.04648
        validation 0-logloss:0.20245
                                         validation 0-error:0.03713
[19]
validation_1-logloss:0.21410
                                 validation 1-error:0.04648
        validation_0-logloss:0.19661
                                         validation_0-error:0.03864
[20]
validation_1-logloss:0.20888
                                 validation_1-error:0.04498
        validation_0-logloss:0.19040
                                         validation_0-error:0.03788
[21]
validation_1-logloss:0.20121
                                 validation_1-error:0.04348
        validation_0-logloss:0.18601
[22]
                                         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
        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
        validation 0-logloss:0.16934
[26]
                                         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
        validation_0-logloss:0.16327
[28]
                                         validation 0-error:0.03413
validation_1-logloss:0.17492
                                 validation_1-error:0.03598
        validation_0-logloss:0.16052
[29]
                                         validation_0-error:0.03376
validation_1-logloss:0.17165
                                 validation_1-error:0.03598
        validation_0-logloss:0.15817
                                         validation_0-error:0.03376
[30]
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
        validation_0-logloss:0.15155
                                         validation_0-error:0.03188
[33]
validation_1-logloss:0.16250
                                validation_1-error:0.03598
        validation 0-logloss:0.14985
                                         validation_0-error:0.03226
[34]
validation 1-logloss:0.15996
                                validation 1-error:0.03748
        validation 0-logloss:0.14818
                                         validation 0-error:0.03188
[35]
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
        validation_0-logloss:0.14368
                                         validation_0-error:0.03151
[38]
validation_1-logloss:0.15703
                                validation_1-error:0.03598
        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
        validation_0-logloss:0.14042
                                        validation_0-error:0.03076
[41]
validation_1-logloss:0.15443
                                validation 1-error:0.03448
[42]
        validation 0-logloss:0.13902
                                         validation 0-error:0.03076
                                validation 1-error:0.03448
validation 1-logloss:0.15348
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)
        validation_0-logloss:0.13758
                                        validation 0-error:0.03076
[43]
validation 1-logloss:0.15267
                                validation 1-error:0.03448
        validation 0-logloss:0.13603
                                         validation 0-error:0.03038
[44]
validation_1-logloss:0.15276
                                validation 1-error:0.03448
        validation_0-logloss:0.13546
                                         validation_0-error:0.03076
[45]
validation_1-logloss:0.15207
                                validation 1-error:0.03448
        validation_0-logloss:0.13467
                                         validation_0-error:0.03001
[46]
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
        validation_0-logloss:0.13062
                                         validation_0-error:0.03001
[51]
validation_1-logloss:0.15225
                                 validation 1-error:0.03448
Γ521
        validation 0-logloss:0.12971
                                         validation 0-error:0.03001
validation 1-logloss:0.15133
                                 validation 1-error:0.03448
        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-error:0.03448
validation_1-logloss:0.14982
        validation_0-logloss:0.12818
                                         validation_0-error:0.03001
[55]
validation_1-logloss:0.15001
                                 validation_1-error:0.03298
        validation_0-logloss:0.12785
                                         validation_0-error:0.03001
[56]
validation_1-logloss:0.14987
                                 validation 1-error:0.03148
        validation_0-logloss:0.12718
[57]
                                         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
                                         validation_0-error:0.02963
[59]
        validation 0-logloss:0.12595
validation 1-logloss:0.14909
                                 validation 1-error:0.03298
        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
        validation_0-logloss:0.12269
                                         validation_0-error:0.02888
[63]
validation_1-logloss:0.14811
                                 validation_1-error:0.03148
[64]
        validation_0-logloss:0.12232
                                         validation_0-error:0.02888
validation_1-logloss:0.14797
                                 validation_1-error:0.03148
[65]
        validation_0-logloss:0.12195
                                         validation_0-error:0.02851
                                 validation_1-error:0.03148
validation_1-logloss:0.14778
[66]
        validation_0-logloss:0.12147
                                         validation_0-error:0.02851
validation 1-logloss:0.14816
                                 validation 1-error:0.03148
        validation 0-logloss:0.12093
                                         validation 0-error:0.02851
validation 1-logloss:0.14827
                                 validation 1-error:0.03148
        validation 0-logloss:0.12059
                                         validation 0-error:0.02813
[68]
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
        validation_0-logloss:0.11912
                                         validation_0-error:0.02851
[70]
validation_1-logloss:0.14694
                                 validation_1-error:0.03148
[71]
        validation_0-logloss:0.11880
                                         validation_0-error:0.02813
validation_1-logloss:0.14683
                                 validation 1-error:0.03148
        validation_0-logloss:0.11821
[72]
                                         validation_0-error:0.02776
validation_1-logloss:0.14675
                                 validation_1-error:0.03148
[73]
        validation_0-logloss:0.11788
                                         validation_0-error:0.02776
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
        validation_0-logloss:0.62140
                                         validation_0-error:0.07164
[0]
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
        validation 0-logloss:0.51301
                                         validation 0-error:0.06489
validation_1-logloss:0.51596
                                 validation 1-error:0.07796
        validation_0-logloss:0.47137
                                         validation 0-error:0.05476
                                 validation_1-error:0.05997
validation_1-logloss:0.47555
[4]
        validation_0-logloss:0.43558
                                         validation_0-error:0.05251
validation_1-logloss:0.44073
                                 validation_1-error:0.05397
        validation_0-logloss:0.40492
                                         validation_0-error:0.05214
validation_1-logloss:0.41100
                                 validation_1-error:0.06297
        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
                                         validation_0-error:0.05251
[8]
        validation_0-logloss:0.33367
validation 1-logloss:0.34079
                                 validation 1-error:0.05697
        validation_0-logloss:0.31474
                                         validation 0-error:0.05251
validation 1-logloss:0.32185
                                 validation 1-error:0.05547
Γ107
        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
        validation 0-logloss:0.22515
                                         validation 0-error:0.04239
validation 1-logloss:0.23544
                                 validation 1-error:0.05247
        validation 0-logloss:0.21706
                                         validation 0-error:0.04126
[17]
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
        validation_0-logloss:0.20263
                                         validation_0-error:0.03901
[19]
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
        validation_0-logloss:0.19088
[21]
                                         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
        validation_0-logloss:0.17793
                                         validation_0-error:0.03751
[24]
validation_1-logloss:0.18732
                                 validation 1-error:0.04498
        validation 0-logloss:0.17408
                                         validation 0-error:0.03713
Γ251
validation 1-logloss:0.18323
                                 validation 1-error:0.04498
        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-error:0.04498
validation_1-logloss:0.17806
        validation_0-logloss:0.16530
                                         validation_0-error:0.03526
[28]
validation_1-logloss:0.17593
                                 validation_1-error:0.04348
        validation_0-logloss:0.16310
                                         validation_0-error:0.03526
[29]
validation_1-logloss:0.17339
                                 validation 1-error:0.04348
        validation_0-logloss:0.16052
[30]
                                         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
        validation 0-logloss:0.15424
                                         validation 0-error:0.03526
validation 1-logloss:0.16674
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.14999
                                         validation_0-error:0.03526
[36]
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
        validation 0-logloss:0.14383
                                         validation 0-error:0.03338
[40]
validation 1-logloss:0.16135
                                 validation 1-error:0.04498
        validation 0-logloss:0.14303
                                         validation 0-error:0.03376
[41]
validation_1-logloss:0.16121
                                 validation 1-error:0.04498
[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
        validation_0-logloss:0.13811
[45]
                                         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
        validation_0-logloss:0.13493
                                         validation_0-error:0.03263
[48]
validation_1-logloss:0.15847
                                 validation 1-error:0.04348
        validation 0-logloss:0.13440
                                         validation 0-error:0.03263
[49]
validation 1-logloss:0.15830
                                 validation 1-error:0.04348
        validation 0-logloss:0.13348
                                         validation 0-error:0.03188
validation_1-logloss:0.15812
                                 validation 1-error:0.04348
[51]
        validation_0-logloss:0.13285
                                         validation 0-error:0.03188
validation_1-logloss:0.15773
                                 validation_1-error:0.04348
[52]
        validation_0-logloss:0.13224
                                         validation_0-error:0.03188
validation_1-logloss:0.15687
                                 validation_1-error:0.04348
        validation_0-logloss:0.13183
                                         validation_0-error:0.03188
[53]
validation_1-logloss:0.15725
                                 validation 1-error:0.04348
        validation_0-logloss:0.13106
[54]
                                         validation_0-error:0.03188
validation_1-logloss:0.15727
                                 validation_1-error:0.04348
[55]
        validation_0-logloss:0.13065
                                         validation_0-error:0.03151
validation_1-logloss:0.15726
                                 validation_1-error:0.04348
[56]
        validation_0-logloss:0.13011
                                         validation_0-error:0.03113
validation 1-logloss:0.15682
                                 validation 1-error:0.04198
        validation 0-logloss:0.12963
                                         validation 0-error:0.03113
validation 1-logloss:0.15642
                                 validation 1-error:0.04198
        validation_0-logloss:0.12916
                                         validation_0-error:0.03076
validation_1-logloss:0.15614
                                 validation_1-error:0.04348
[59]
        validation_0-logloss:0.12870
                                         validation_0-error:0.03113
validation_1-logloss:0.15610
                                 validation_1-error:0.04198
[60]
        validation_0-logloss:0.12822
                                         validation_0-error:0.03113
validation_1-logloss:0.15665
                                 validation_1-error:0.04498
        validation_0-logloss:0.12779
[61]
                                         validation_0-error:0.03113
validation_1-logloss:0.15670
                                 validation_1-error:0.04348
[62]
        validation_0-logloss:0.12699
                                         validation_0-error:0.03113
                                 validation_1-error:0.04348
validation_1-logloss:0.15622
[63]
        validation_0-logloss:0.12662
                                         validation_0-error:0.03113
validation 1-logloss:0.15601
                                 validation 1-error:0.04348
        validation 0-logloss:0.12622
                                         validation 0-error:0.03113
validation 1-logloss:0.15619
                                 validation 1-error:0.04498
[65]
        validation 0-logloss:0.12544
                                         validation 0-error:0.03076
validation_1-logloss:0.15618
                                 validation 1-error:0.04498
        validation_0-logloss:0.12475
                                         validation_0-error:0.03076
[66]
validation_1-logloss:0.15593
                                 validation 1-error:0.04498
        validation_0-logloss:0.12440
                                         validation_0-error:0.03076
[67]
validation_1-logloss:0.15605
                                 validation_1-error:0.04498
[68]
        validation_0-logloss:0.12396
                                         validation_0-error:0.03076
validation_1-logloss:0.15599
                                 validation 1-error:0.04498
        validation_0-logloss:0.12365
[69]
                                         validation_0-error:0.03076
validation_1-logloss:0.15593
                                 validation_1-error:0.04648
[70]
        validation_0-logloss:0.12291
                                         validation_0-error:0.03076
validation_1-logloss:0.15541
                                 validation_1-error:0.04498
```

```
[71]
        validation_0-logloss:0.12251
                                        validation_0-error:0.03076
validation_1-logloss:0.15599
                                validation_1-error:0.04648
        validation_0-logloss:0.12185
[72]
                                        validation_0-error:0.03038
validation 1-logloss:0.15585
                                validation 1-error:0.04648
        validation 0-logloss:0.12168
                                         validation 0-error:0.03038
[73]
validation 1-logloss:0.15603
                                validation 1-error:0.04798
        validation 0-logloss:0.12122
                                         validation 0-error:0.03001
validation_1-logloss:0.15620
                                 validation 1-error:0.04798
        validation_0-logloss:0.62126
                                         validation 0-error:0.07014
validation_1-logloss:0.62301
                                validation_1-error:0.08696
        validation_0-logloss:0.56249
                                         validation_0-error:0.06864
[1]
validation_1-logloss:0.56531
                                validation_1-error:0.07946
        validation_0-logloss:0.51301
                                         validation_0-error:0.06639
validation_1-logloss:0.51618
                                validation_1-error:0.08246
        validation_0-logloss:0.47133
[3]
                                         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
        validation 0-logloss:0.37547
                                         validation 0-error:0.05551
validation 1-logloss:0.38175
                                validation 1-error:0.06897
        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
        validation_0-logloss:0.30979
                                         validation_0-error:0.04464
[9]
validation_1-logloss:0.31881
                                validation_1-error:0.05697
        validation_0-logloss:0.29335
                                         validation_0-error:0.04614
[10]
validation_1-logloss:0.30327
                                validation_1-error:0.05847
        validation_0-logloss:0.27779
                                         validation_0-error:0.04426
[11]
                                validation_1-error:0.05547
validation_1-logloss:0.28834
[12]
        validation_0-logloss:0.26348
                                         validation_0-error:0.04389
validation 1-logloss:0.27317
                                validation 1-error:0.05547
        validation 0-logloss:0.25116
                                         validation 0-error:0.04314
validation 1-logloss:0.26218
                                validation 1-error:0.05697
        validation 0-logloss:0.24026
                                         validation 0-error:0.04201
[14]
validation_1-logloss:0.25123
                                validation 1-error:0.05847
        validation_0-logloss:0.23030
                                         validation_0-error:0.04088
[15]
validation_1-logloss:0.24278
                                validation 1-error:0.05847
        validation_0-logloss:0.22143
                                         validation_0-error:0.04088
[16]
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)
        validation_0-logloss:0.20629
                                         validation 0-error:0.03976
Г18<sub>]</sub>
validation_1-logloss:0.22036
                                 validation_1-error:0.05847
                                         validation_0-error:0.04013
[19]
        validation_0-logloss:0.19984
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
        validation_0-logloss:0.18852
[21]
                                         validation_0-error:0.03638
validation_1-logloss:0.20243
                                 validation_1-error:0.05247
        validation 0-logloss:0.18424
[22]
                                         validation 0-error:0.03563
validation_1-logloss:0.19886
                                 validation_1-error:0.05397
        validation_0-logloss:0.17949
                                         validation 0-error:0.03526
[23]
validation_1-logloss:0.19336
                                 validation_1-error:0.05247
        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
        validation_0-logloss:0.16184
[28]
                                         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
        validation_0-logloss:0.15518
                                         validation_0-error:0.03226
[31]
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
        validation_0-logloss:0.14765
                                         validation_0-error:0.03113
[35]
validation_1-logloss:0.16532
                                 validation_1-error:0.04348
        validation_0-logloss:0.14584
                                         validation_0-error:0.03038
[36]
```

validation_1-error:0.04198

validation_1-logloss:0.16288

```
[37]
        validation_0-logloss:0.14453
                                         validation_0-error:0.03001
validation_1-logloss:0.16258
                                 validation_1-error:0.04198
        validation_0-logloss:0.14301
                                         validation_0-error:0.03001
[38]
validation 1-logloss:0.16051
                                 validation 1-error:0.04348
        validation 0-logloss:0.14196
                                         validation 0-error:0.03038
[39]
validation 1-logloss:0.16021
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.13745
                                         validation_0-error:0.02963
[43]
validation_1-logloss:0.15635
                                 validation 1-error:0.04198
        validation_0-logloss:0.13587
[44]
                                         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
                                         validation_0-error:0.02888
[46]
        validation 0-logloss:0.13406
validation 1-logloss:0.15404
                                 validation 1-error:0.04348
        validation 0-logloss:0.13299
                                         validation 0-error:0.02851
validation 1-logloss:0.15399
                                 validation 1-error:0.04348
۲481
        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
[50]
        validation_0-logloss:0.12976
                                         validation_0-error:0.02851
validation_1-logloss:0.15265
                                 validation_1-error:0.04048
[51]
        validation_0-logloss:0.12940
                                         validation_0-error:0.02888
validation_1-logloss:0.15282
                                 validation_1-error:0.04048
[52]
        validation_0-logloss:0.12880
                                         validation_0-error:0.02926
validation_1-logloss:0.15241
                                 validation_1-error:0.04048
[53]
        validation_0-logloss:0.12823
                                         validation_0-error:0.02926
validation 1-logloss:0.15268
                                 validation 1-error:0.04048
        validation 0-logloss:0.12751
                                         validation 0-error:0.02888
[54]
                                 validation 1-error:0.04198
validation 1-logloss:0.15237
[55]
        validation 0-logloss:0.12670
                                         validation 0-error:0.02813
validation_1-logloss:0.15255
                                 validation 1-error:0.04198
        validation_0-logloss:0.12632
                                         validation_0-error:0.02851
[56]
validation_1-logloss:0.15253
                                 validation 1-error:0.04348
        validation_0-logloss:0.12569
                                         validation_0-error:0.02813
[57]
validation_1-logloss:0.15250
                                 validation_1-error:0.04348
[58]
        validation_0-logloss:0.12469
                                         validation_0-error:0.02813
validation_1-logloss:0.15285
                                 validation 1-error:0.04198
        validation_0-logloss:0.12414
[59]
                                         validation_0-error:0.02851
validation_1-logloss:0.15293
                                 validation_1-error:0.04048
[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
validation_1-logloss:0.15292
                                 validation_1-error:0.04198
        validation_0-logloss:0.12260
                                         validation_0-error:0.02851
[62]
validation_1-logloss:0.15293
                                 validation 1-error:0.04198
        validation 0-logloss:0.12214
                                         validation 0-error:0.02813
Γ631
validation 1-logloss:0.15304
                                 validation 1-error:0.04048
        validation 0-logloss:0.12157
                                         validation 0-error:0.02813
validation_1-logloss:0.15288
                                 validation 1-error:0.03898
[65]
        validation_0-logloss:0.12078
                                         validation 0-error:0.02851
                                 validation_1-error:0.03898
validation_1-logloss:0.15169
        validation_0-logloss:0.12029
                                         validation_0-error:0.02851
[66]
validation_1-logloss:0.15202
                                 validation_1-error:0.04048
        validation_0-logloss:0.12003
                                         validation_0-error:0.02851
[67]
validation_1-logloss:0.15188
                                 validation 1-error:0.03898
        validation_0-logloss:0.11946
[68]
                                         validation_0-error:0.02851
validation_1-logloss:0.15183
                                 validation_1-error:0.04198
[69]
        validation_0-logloss:0.11903
                                         validation_0-error:0.02813
validation_1-logloss:0.15159
                                 validation_1-error:0.04198
                                         validation_0-error:0.02813
[70]
        validation_0-logloss:0.11876
validation 1-logloss:0.15148
                                 validation 1-error:0.04198
        validation 0-logloss:0.11829
                                         validation 0-error:0.02813
validation 1-logloss:0.15154
                                 validation 1-error:0.04198
[72]
        validation_0-logloss:0.11767
                                         validation_0-error:0.02776
validation_1-logloss:0.15063
                                 validation 1-error:0.03748
[73]
        validation_0-logloss:0.11722
                                         validation_0-error:0.02813
validation_1-logloss:0.15075
                                 validation_1-error:0.03748
        validation_0-logloss:0.11698
[74]
                                         validation_0-error:0.02851
validation_1-logloss:0.15086
                                 validation_1-error:0.03748
        validation_0-logloss:0.62077
[0]
                                         validation_0-error:0.07127
validation_1-logloss:0.62326
                                 validation_1-error:0.09145
        validation_0-logloss:0.56152
                                         validation_0-error:0.07089
[1]
                                 validation_1-error:0.08846
validation_1-logloss:0.56583
[2]
        validation_0-logloss:0.51231
                                         validation_0-error:0.07127
validation 1-logloss:0.51891
                                 validation 1-error:0.08846
        validation 0-logloss:0.46992
                                         validation 0-error:0.07089
validation 1-logloss:0.47802
                                 validation 1-error:0.09145
        validation 0-logloss:0.43456
                                         validation 0-error:0.07089
validation_1-logloss:0.44444
                                 validation 1-error:0.09145
        validation_0-logloss:0.40339
                                         validation_0-error:0.07089
[5]
validation_1-logloss:0.41329
                                 validation 1-error:0.09145
        validation_0-logloss:0.37649
                                         validation_0-error:0.07052
[6]
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
        validation_0-logloss:0.33127
[8]
                                         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
        validation_0-logloss:0.27772
                                         validation_0-error:0.05364
[11]
validation_1-logloss:0.29066
                                 validation 1-error:0.06897
Γ127
        validation 0-logloss:0.26394
                                         validation 0-error:0.05176
validation 1-logloss:0.27842
                                 validation 1-error:0.06897
        validation 0-logloss:0.25181
                                         validation 0-error:0.04876
validation_1-logloss:0.26658
                                 validation 1-error:0.06147
        validation_0-logloss:0.24123
                                         validation 0-error:0.04426
[14]
validation_1-logloss:0.25701
                                 validation_1-error:0.06297
        validation_0-logloss:0.23183
                                         validation_0-error:0.04351
[15]
validation_1-logloss:0.24820
                                 validation_1-error:0.06147
        validation_0-logloss:0.22302
[16]
                                         validation_0-error:0.04239
validation_1-logloss:0.24008
                                 validation_1-error:0.05997
        validation_0-logloss:0.21552
[17]
                                         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
        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
        validation_0-logloss:0.18387
                                         validation_0-error:0.03976
[23]
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
        validation 0-logloss:0.16894
                                         validation 0-error:0.03676
validation 1-logloss:0.19116
                                 validation 1-error:0.05097
        validation 0-logloss:0.16582
                                         validation 0-error:0.03713
[28]
validation_1-logloss:0.18705
                                 validation 1-error:0.04947
        validation_0-logloss:0.16333
                                         validation_0-error:0.03713
[29]
validation_1-logloss:0.18479
                                 validation 1-error:0.04947
        validation_0-logloss:0.16120
                                         validation_0-error:0.03601
[30]
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
        validation_0-logloss:0.15660
[32]
                                         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
        validation_0-logloss:0.15209
                                         validation_0-error:0.03488
[35]
validation_1-logloss:0.17661
                                 validation 1-error:0.04947
        validation 0-logloss:0.15026
                                         validation 0-error:0.03488
[36]
validation 1-logloss:0.17438
                                 validation 1-error:0.04798
        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
        validation_0-logloss:0.14597
                                         validation_0-error:0.03413
[39]
validation_1-logloss:0.17219
                                 validation_1-error:0.04798
        validation_0-logloss:0.14499
                                         validation_0-error:0.03376
[40]
validation_1-logloss:0.17234
                                 validation 1-error:0.04798
        validation_0-logloss:0.14402
[41]
                                         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
        validation 0-logloss:0.14062
                                         validation 0-error:0.03226
validation 1-logloss:0.17064
                                 validation 1-error:0.04798
        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
[50]
        validation_0-logloss:0.13578
                                         validation_0-error:0.03113
validation 1-logloss:0.16977
                                 validation 1-error:0.04648
        validation 0-logloss:0.13511
                                         validation 0-error:0.03113
[51]
validation 1-logloss:0.16946
                                 validation 1-error:0.04498
[52]
        validation 0-logloss:0.13395
                                         validation 0-error:0.03113
validation_1-logloss:0.16801
                                 validation 1-error:0.04498
        validation_0-logloss:0.13264
                                         validation_0-error:0.03113
[53]
validation_1-logloss:0.16756
                                 validation 1-error:0.04498
        validation_0-logloss:0.13213
                                         validation_0-error:0.03076
[54]
validation_1-logloss:0.16739
                                 validation_1-error:0.04498
[55]
        validation_0-logloss:0.13133
                                         validation_0-error:0.03076
validation_1-logloss:0.16786
                                 validation 1-error:0.04498
        validation_0-logloss:0.13032
[56]
                                         validation_0-error:0.03076
validation_1-logloss:0.16766
                                 validation_1-error:0.04498
[57]
        validation_0-logloss:0.12966
                                         validation_0-error:0.03076
validation_1-logloss:0.16700
                                 validation_1-error:0.04498
```

```
[58]
        validation_0-logloss:0.12851
                                         validation_0-error:0.03038
validation_1-logloss:0.16731
                                 validation_1-error:0.04648
        validation_0-logloss:0.12808
                                         validation_0-error:0.03076
[59]
validation_1-logloss:0.16758
                                 validation 1-error:0.04648
        validation 0-logloss:0.12740
                                         validation 0-error:0.03038
[60]
validation 1-logloss:0.16668
                                 validation 1-error:0.04798
        validation 0-logloss:0.12689
                                         validation 0-error:0.03038
validation_1-logloss:0.16671
                                 validation 1-error:0.04798
[62]
        validation_0-logloss:0.12586
                                         validation 0-error:0.03038
validation_1-logloss:0.16611
                                 validation_1-error:0.04798
        validation_0-logloss:0.12544
                                         validation_0-error:0.03001
[63]
validation_1-logloss:0.16656
                                 validation_1-error:0.04798
        validation_0-logloss:0.12502
                                         validation_0-error:0.03001
[64]
validation_1-logloss:0.16654
                                 validation 1-error:0.04798
        validation_0-logloss:0.12431
[65]
                                         validation_0-error:0.03001
validation_1-logloss:0.16622
                                 validation_1-error:0.04798
[66]
        validation_0-logloss:0.12375
                                         validation_0-error:0.03001
validation_1-logloss:0.16614
                                 validation_1-error:0.04798
[67]
        validation_0-logloss:0.12289
                                         validation_0-error:0.03001
validation 1-logloss:0.16614
                                 validation 1-error:0.04648
        validation_0-logloss:0.12246
                                         validation 0-error:0.03001
validation 1-logloss:0.16593
                                 validation 1-error:0.04648
        validation_0-logloss:0.12178
                                         validation_0-error:0.03001
validation_1-logloss:0.16574
                                 validation_1-error:0.04648
[70]
        validation_0-logloss:0.12109
                                         validation_0-error:0.02926
validation_1-logloss:0.16563
                                 validation_1-error:0.04648
        validation_0-logloss:0.12073
                                         validation_0-error:0.02963
[71]
validation_1-logloss:0.16564
                                 validation_1-error:0.04648
[72]
        validation_0-logloss:0.12026
                                         validation_0-error:0.02963
validation_1-logloss:0.16605
                                 validation_1-error:0.04648
[73]
        validation_0-logloss:0.11978
                                         validation_0-error:0.03001
validation_1-logloss:0.16588
                                 validation_1-error:0.04648
[74]
        validation_0-logloss:0.11942
                                         validation_0-error:0.03001
validation_1-logloss:0.16601
                                 validation 1-error:0.04648
        validation 0-logloss:0.62173
                                         validation 0-error:0.07277
                                 validation 1-error:0.08995
validation 1-logloss:0.62358
        validation 0-logloss:0.56311
                                         validation 0-error:0.05664
validation_1-logloss:0.56579
                                 validation 1-error:0.06597
        validation_0-logloss:0.51379
                                         validation_0-error:0.06977
[2]
validation_1-logloss:0.51841
                                 validation 1-error:0.08846
        validation_0-logloss:0.47240
                                         validation_0-error:0.05664
[3]
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
        validation_0-logloss:0.40649
[5]
                                         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
        validation_0-logloss:0.33175
                                         validation_0-error:0.05514
[8]
validation 1-logloss:0.33980
                                validation 1-error:0.06747
        validation 0-logloss:0.31230
                                         validation 0-error:0.05476
[9]
validation 1-logloss:0.32146
                                validation 1-error:0.06747
        validation 0-logloss:0.29549
                                         validation_0-error:0.05439
validation_1-logloss:0.30510
                                 validation 1-error:0.06597
        validation_0-logloss:0.27966
                                         validation 0-error:0.04689
[11]
validation_1-logloss:0.29011
                                validation_1-error:0.05847
        validation_0-logloss:0.26601
[12]
                                         validation_0-error:0.04501
validation_1-logloss:0.27683
                                validation_1-error:0.05697
        validation_0-logloss:0.25365
                                         validation_0-error:0.04276
[13]
validation_1-logloss:0.26489
                                validation_1-error:0.05547
        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
        validation 0-logloss:0.21600
                                         validation 0-error:0.04314
validation 1-logloss:0.22860
                                validation 1-error:0.05397
Г18<sub>]</sub>
        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
        validation_0-logloss:0.19706
[20]
                                         validation_0-error:0.03901
validation_1-logloss:0.21142
                                validation_1-error:0.05247
        validation_0-logloss:0.19081
[21]
                                         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:
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)
[22]
        validation_0-logloss:0.18632
                                         validation_0-error:0.03751
validation_1-logloss:0.20007
                                validation_1-error:0.05397
        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
                                         validation_0-error:0.03638
[29]
        validation_0-logloss:0.16171
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
        validation_0-logloss:0.15748
                                         validation_0-error:0.03563
[31]
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
Γ341
        validation 0-logloss:0.15319
                                         validation 0-error:0.03601
validation 1-logloss:0.17087
                                 validation 1-error:0.04947
        validation 0-logloss:0.15194
                                         validation 0-error:0.03526
[35]
validation_1-logloss:0.17028
                                 validation 1-error:0.04947
        validation_0-logloss:0.14993
                                         validation_0-error:0.03451
[36]
validation_1-logloss:0.16912
                                 validation_1-error:0.04798
        validation_0-logloss:0.14894
                                         validation_0-error:0.03413
[37]
validation_1-logloss:0.16899
                                 validation_1-error:0.04947
        validation_0-logloss:0.14718
                                         validation_0-error:0.03376
[38]
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
        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
        validation 0-logloss:0.14263
[42]
                                         validation 0-error:0.03338
validation 1-logloss:0.16457
                                 validation_1-error:0.04648
Γ431
        validation_0-logloss:0.14193
                                         validation 0-error:0.03301
validation_1-logloss:0.16431
                                 validation_1-error:0.04648
        validation_0-logloss:0.14095
                                         validation 0-error:0.03338
Γ441
validation_1-logloss:0.16462
                                 validation_1-error:0.04648
        validation_0-logloss:0.14033
[45]
                                         validation_0-error:0.03338
validation_1-logloss:0.16451
                                 validation_1-error:0.04648
        validation_0-logloss:0.13959
                                         validation_0-error:0.03301
[46]
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
[50]
        validation_0-logloss:0.13529
                                         validation_0-error:0.03301
validation 1-logloss:0.16291
                                 validation 1-error:0.04648
        validation 0-logloss:0.13422
                                         validation 0-error:0.03226
[51]
validation 1-logloss:0.16253
                                 validation 1-error:0.04648
[52]
        validation_0-logloss:0.13301
                                         validation_0-error:0.03263
validation 1-logloss:0.16242
                                 validation 1-error:0.04648
                                         validation_0-error:0.03226
[53]
        validation_0-logloss:0.13198
validation_1-logloss:0.16247
                                 validation_1-error:0.04648
[54]
        validation_0-logloss:0.13155
                                         validation_0-error:0.03226
validation_1-logloss:0.16256
                                 validation_1-error:0.04648
        validation_0-logloss:0.13133
                                         validation_0-error:0.03226
[55]
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
Γ581
        validation 0-logloss:0.12913
                                         validation 0-error:0.03263
validation 1-logloss:0.16138
                                 validation 1-error:0.04648
        validation 0-logloss:0.12834
                                         validation 0-error:0.03226
[59]
validation_1-logloss:0.16090
                                 validation 1-error:0.04648
        validation_0-logloss:0.12789
                                         validation 0-error:0.03113
[60]
validation_1-logloss:0.16055
                                 validation_1-error:0.04648
        validation_0-logloss:0.12726
                                         validation_0-error:0.03151
[61]
validation_1-logloss:0.16087
                                 validation_1-error:0.04648
        validation_0-logloss:0.12678
[62]
                                         validation_0-error:0.03113
validation_1-logloss:0.16136
                                 validation 1-error:0.04648
[63]
        validation_0-logloss:0.12646
                                         validation_0-error:0.03076
validation_1-logloss:0.16152
                                 validation_1-error:0.04648
        validation_0-logloss:0.12616
                                         validation_0-error:0.03076
validation_1-logloss:0.16160
                                 validation_1-error:0.04648
[65]
        validation_0-logloss:0.12580
                                         validation_0-error:0.03113
validation 1-logloss:0.16155
                                 validation 1-error:0.04648
        validation 0-logloss:0.12525
[66]
                                         validation 0-error:0.03113
validation 1-logloss:0.16162
                                 validation_1-error:0.04648
[67]
        validation_0-logloss:0.12489
                                         validation 0-error:0.03113
validation_1-logloss:0.16140
                                 validation_1-error:0.04648
        validation_0-logloss:0.12448
                                         validation 0-error:0.03113
[68]
validation_1-logloss:0.16145
                                 validation_1-error:0.04498
        validation_0-logloss:0.12414
                                         validation_0-error:0.03113
[69]
validation_1-logloss:0.16156
                                 validation_1-error:0.04498
        validation_0-logloss:0.12376
                                         validation_0-error:0.03038
[70]
validation_1-logloss:0.16165
                                 validation_1-error:0.04498
[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
        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
                                         validation_0-error:0.06977
        validation_0-logloss:0.51397
validation_1-logloss:0.51860
                                 validation_1-error:0.08846
        validation_0-logloss:0.47256
                                         validation_0-error:0.05851
[3]
validation_1-logloss:0.47799
                                 validation_1-error:0.06897
        validation_0-logloss:0.43700
                                         validation_0-error:0.05851
validation_1-logloss:0.44342
                                 validation_1-error:0.06897
        validation_0-logloss:0.40644
                                         validation_0-error:0.05664
validation_1-logloss:0.41402
                                 validation_1-error:0.07046
        validation_0-logloss:0.37993
                                         validation_0-error:0.05664
[6]
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
        validation 0-logloss:0.33442
                                         validation 0-error:0.05626
[8]
validation_1-logloss:0.34355
                                 validation_1-error:0.07046
        validation 0-logloss:0.31471
                                         validation_0-error:0.05439
validation_1-logloss:0.32344
                                 validation_1-error:0.06147
        validation_0-logloss:0.29682
                                         validation_0-error:0.05664
[10]
validation_1-logloss:0.30648
                                 validation_1-error:0.07046
        validation_0-logloss:0.28067
                                         validation_0-error:0.05289
[11]
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
        validation_0-logloss:0.25407
[13]
                                         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
        validation 0-logloss:0.23320
[15]
                                         validation 0-error:0.04088
validation 1-logloss:0.24494
                                 validation 1-error:0.04947
Г16Т
        validation_0-logloss:0.22346
                                         validation 0-error:0.04088
validation_1-logloss:0.23392
                                 validation_1-error:0.04648
        validation_0-logloss:0.21588
[17]
                                         validation 0-error:0.04013
validation_1-logloss:0.22683
                                 validation_1-error:0.04648
        validation_0-logloss:0.20914
                                         validation_0-error:0.03826
[18]
validation_1-logloss:0.22003
                                 validation_1-error:0.04648
        validation_0-logloss:0.20245
                                         validation_0-error:0.03713
[19]
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
                                         validation_0-error:0.03526
[26]
        validation_0-logloss:0.16934
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
        validation_0-logloss:0.16327
                                         validation_0-error:0.03413
[28]
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
Γ317
        validation 0-logloss:0.15555
                                         validation 0-error:0.03301
validation 1-logloss:0.16649
                                 validation 1-error:0.03598
        validation 0-logloss:0.15348
                                         validation 0-error:0.03226
[32]
validation_1-logloss:0.16501
                                 validation_1-error:0.03598
        validation 0-logloss:0.15155
                                         validation_0-error:0.03188
[33]
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
        validation_0-logloss:0.14818
[35]
                                         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
        validation 0-logloss:0.14230
[39]
                                         validation 0-error:0.03113
validation 1-logloss:0.15623
                                 validation_1-error:0.03298
Γ401
        validation_0-logloss:0.14097
                                         validation 0-error:0.03076
validation_1-logloss:0.15492
                                 validation_1-error:0.03448
        validation_0-logloss:0.14042
                                         validation 0-error:0.03076
[41]
validation_1-logloss:0.15443
                                 validation_1-error:0.03448
        validation_0-logloss:0.13902
[42]
                                         validation_0-error:0.03076
validation_1-logloss:0.15348
                                 validation_1-error:0.03448
        validation_0-logloss:0.13758
                                         validation_0-error:0.03076
[43]
validation_1-logloss:0.15267
                                 validation_1-error:0.03448
        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
        validation 0-logloss:0.13273
                                         validation 0-error:0.03038
[48]
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
        validation_0-logloss:0.12971
                                         validation_0-error:0.03001
[52]
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
        validation 0-logloss:0.12785
                                         validation 0-error:0.03001
[56]
validation_1-logloss:0.14987
                                 validation_1-error:0.03148
        validation_0-logloss:0.12718
                                         validation 0-error:0.03001
[57]
validation_1-logloss:0.14922
                                 validation_1-error:0.03148
        validation_0-logloss:0.12621
                                         validation_0-error:0.03001
[58]
validation_1-logloss:0.14879
                                 validation_1-error:0.03148
        validation_0-logloss:0.12595
[59]
                                         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
        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
        validation 0-logloss:0.12269
[63]
                                         validation 0-error:0.02888
validation 1-logloss:0.14811
                                 validation 1-error:0.03148
[64]
        validation_0-logloss:0.12232
                                         validation 0-error:0.02888
validation_1-logloss:0.14797
                                 validation_1-error:0.03148
        validation_0-logloss:0.12195
[65]
                                         validation_0-error:0.02851
validation_1-logloss:0.14778
                                 validation_1-error:0.03148
        validation_0-logloss:0.12147
                                         validation_0-error:0.02851
[66]
validation_1-logloss:0.14816
                                 validation_1-error:0.03148
        validation_0-logloss:0.12093
                                         validation_0-error:0.02851
[67]
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:0.14694
                                validation_1-error:0.03148
        validation 0-logloss:0.11880
                                         validation_0-error:0.02813
[71]
validation 1-logloss:0.14683
                                validation 1-error:0.03148
[72]
        validation 0-logloss:0.11821
                                         validation 0-error:0.02776
validation 1-logloss:0.14675
                                validation 1-error:0.03148
[73]
        validation_0-logloss:0.11788
                                         validation_0-error:0.02776
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
[75]
        validation_0-logloss:0.11690
                                         validation_0-error:0.02813
validation_1-logloss:0.14575
                                validation_1-error:0.03148
        validation_0-logloss:0.11624
                                        validation_0-error:0.02813
validation_1-logloss:0.14617
                                validation_1-error:0.03148
[77]
        validation_0-logloss:0.11575
                                         validation_0-error:0.02776
validation_1-logloss:0.14628
                                validation_1-error:0.03148
[78]
        validation_0-logloss:0.11523
                                         validation_0-error:0.02776
validation_1-logloss:0.14583
                                validation 1-error:0.03148
[79]
        validation 0-logloss:0.11457
                                         validation 0-error:0.02738
validation 1-logloss:0.14564
                                validation 1-error:0.03148
        validation 0-logloss:0.11414
[80]
                                         validation 0-error:0.02701
validation_1-logloss:0.14574
                                validation_1-error:0.03148
        validation 0-logloss:0.11375
                                         validation_0-error:0.02701
[81]
validation_1-logloss:0.14571
                                validation_1-error:0.03148
        validation_0-logloss:0.11321
[82]
                                         validation_0-error:0.02626
validation_1-logloss:0.14537
                                validation_1-error:0.03148
        validation_0-logloss:0.11224
[83]
                                        validation_0-error:0.02663
validation_1-logloss:0.14488
                                validation 1-error:0.03148
[84]
        validation_0-logloss:0.11182
                                         validation_0-error:0.02663
validation_1-logloss:0.14514
                                validation_1-error:0.03148
        validation_0-logloss:0.11141
                                         validation_0-error:0.02588
validation_1-logloss:0.14466
                                validation_1-error:0.03148
        validation_0-logloss:0.11102
                                         validation_0-error:0.02588
[86]
validation 1-logloss:0.14483
                                validation 1-error:0.03148
        validation 0-logloss:0.11036
[87]
                                         validation 0-error:0.02551
validation 1-logloss:0.14521
                                validation 1-error:0.03148
[88]
        validation_0-logloss:0.11009
                                         validation 0-error:0.02551
validation_1-logloss:0.14535
                                validation_1-error:0.03148
        validation 0-logloss:0.10967
[89]
                                         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)
```

validation_1-error:0.03148

validation_0-error:0.02851

validation_1-logloss:0.14752

validation_0-logloss:0.11912

[70]

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)

validation 0-logloss:0.62140 validation 0-error:0.07164 [0] 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 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 validation_0-logloss:0.43558 [4] 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 validation_0-logloss:0.37836 validation_0-error:0.05326 validation_1-logloss:0.38544 validation 1-error:0.06597 validation_0-logloss:0.35511 validation_0-error:0.05214 validation 1-logloss:0.36291 validation 1-error:0.06147 validation_0-logloss:0.33367 validation_0-error:0.05251 [8] validation 1-logloss:0.34079 validation 1-error:0.05697 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 validation_0-logloss:0.28054 validation_0-error:0.05289 [11] validation_1-logloss:0.28840 validation_1-error:0.05697 validation_0-logloss:0.26654 validation_0-error:0.05139 [12] validation_1-logloss:0.27443 validation_1-error:0.05397 validation_0-logloss:0.25455 validation_0-error:0.05101 validation_1-logloss:0.26286 validation 1-error:0.05397 **Γ14**] validation_0-logloss:0.24327 validation_0-error:0.04876 validation_1-logloss:0.25264 validation_1-error:0.05097 validation_0-logloss:0.23381 validation 0-error:0.04013 [15] validation_1-logloss:0.24341 validation_1-error:0.04648 validation 0-logloss:0.22515 validation 0-error:0.04239 Г16**Т** 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 validation_0-logloss:0.20897 [18] 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 validation_0-logloss:0.19688 [20] 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
Γ241
        validation_0-logloss:0.17793
                                         validation_0-error:0.03751
validation 1-logloss:0.18732
                                 validation 1-error:0.04498
                                         validation_0-error:0.03713
[25]
        validation_0-logloss:0.17408
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
        validation_0-logloss:0.16809
                                         validation_0-error:0.03563
[27]
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
        validation 0-logloss:0.15768
                                         validation 0-error:0.03488
[31]
validation_1-logloss:0.16930
                                 validation 1-error:0.04348
        validation_0-logloss:0.15564
                                         validation_0-error:0.03451
[32]
validation_1-logloss:0.16762
                                 validation_1-error:0.04348
        validation_0-logloss:0.15424
                                         validation_0-error:0.03526
[33]
validation_1-logloss:0.16674
                                 validation_1-error:0.04348
        validation_0-logloss:0.15238
                                         validation_0-error:0.03563
[34]
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
        validation_0-logloss:0.14999
                                         validation_0-error:0.03526
[36]
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
        validation 0-logloss:0.14710
[38]
                                         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
        validation_0-logloss:0.14383
                                         validation 0-error:0.03338
Γ401
validation_1-logloss:0.16135
                                 validation_1-error:0.04498
        validation_0-logloss:0.14303
[41]
                                         validation_0-error:0.03376
validation_1-logloss:0.16121
                                 validation_1-error:0.04498
[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
        validation_0-logloss:0.13493
[48]
                                         validation_0-error:0.03263
validation 1-logloss:0.15847
                                 validation 1-error:0.04348
                                         validation_0-error:0.03263
        validation_0-logloss:0.13440
[49]
validation_1-logloss:0.15830
                                 validation_1-error:0.04348
[50]
        validation_0-logloss:0.13348
                                         validation_0-error:0.03188
validation_1-logloss:0.15812
                                 validation_1-error:0.04348
        validation_0-logloss:0.13285
                                         validation_0-error:0.03188
[51]
validation_1-logloss:0.15773
                                 validation_1-error:0.04348
[52]
        validation_0-logloss:0.13224
                                         validation_0-error:0.03188
validation_1-logloss:0.15687
                                 validation_1-error:0.04348
[53]
        validation_0-logloss:0.13183
                                         validation_0-error:0.03188
validation_1-logloss:0.15725
                                 validation 1-error:0.04348
Γ54]
        validation 0-logloss:0.13106
                                         validation 0-error:0.03188
validation 1-logloss:0.15727
                                 validation 1-error:0.04348
        validation 0-logloss:0.13065
                                         validation 0-error:0.03151
[55]
validation_1-logloss:0.15726
                                 validation 1-error:0.04348
        validation_0-logloss:0.13011
                                         validation_0-error:0.03113
[56]
validation_1-logloss:0.15682
                                 validation_1-error:0.04198
        validation_0-logloss:0.12963
                                         validation_0-error:0.03113
[57]
validation_1-logloss:0.15642
                                 validation_1-error:0.04198
        validation_0-logloss:0.12916
                                         validation_0-error:0.03076
[58]
validation_1-logloss:0.15614
                                 validation 1-error:0.04348
[59]
        validation_0-logloss:0.12870
                                         validation_0-error:0.03113
validation_1-logloss:0.15610
                                 validation_1-error:0.04198
        validation_0-logloss:0.12822
[60]
                                         validation_0-error:0.03113
validation_1-logloss:0.15665
                                 validation_1-error:0.04498
[61]
        validation_0-logloss:0.12779
                                         validation_0-error:0.03113
validation 1-logloss:0.15670
                                 validation 1-error:0.04348
        validation 0-logloss:0.12699
[62]
                                         validation 0-error:0.03113
                                 validation_1-error:0.04348
validation 1-logloss:0.15622
[63]
        validation_0-logloss:0.12662
                                         validation 0-error:0.03113
validation_1-logloss:0.15601
                                 validation_1-error:0.04348
        validation_0-logloss:0.12622
                                         validation 0-error:0.03113
[64]
validation_1-logloss:0.15619
                                 validation_1-error:0.04498
        validation_0-logloss:0.12544
                                         validation_0-error:0.03076
[65]
validation_1-logloss:0.15618
                                 validation_1-error:0.04498
[66]
        validation_0-logloss:0.12475
                                         validation_0-error:0.03076
validation_1-logloss:0.15593
                                 validation_1-error:0.04498
[67]
        validation_0-logloss:0.12440
                                         validation_0-error:0.03076
validation_1-logloss:0.15605
                                 validation_1-error:0.04498
[68]
        validation_0-logloss:0.12396
                                         validation_0-error:0.03076
```

```
validation_1-logloss:0.15599
                                 validation_1-error:0.04498
[69]
        validation_0-logloss:0.12365
                                         validation_0-error:0.03076
validation_1-logloss:0.15593
                                 validation_1-error:0.04648
[70]
        validation_0-logloss:0.12291
                                         validation_0-error:0.03076
validation 1-logloss:0.15541
                                 validation 1-error:0.04498
[71]
        validation 0-logloss:0.12251
                                         validation 0-error:0.03076
validation 1-logloss:0.15599
                                 validation 1-error:0.04648
[72]
        validation_0-logloss:0.12185
                                         validation_0-error:0.03038
validation 1-logloss:0.15585
                                 validation 1-error:0.04648
                                         validation_0-error:0.03038
[73]
        validation_0-logloss:0.12168
validation_1-logloss:0.15603
                                 validation_1-error:0.04798
[74]
        validation_0-logloss:0.12122
                                         validation_0-error:0.03001
validation_1-logloss:0.15620
                                 validation_1-error:0.04798
        validation_0-logloss:0.12085
                                         validation_0-error:0.03001
[75]
validation_1-logloss:0.15560
                                 validation_1-error:0.04798
[76]
        validation_0-logloss:0.12048
                                         validation_0-error:0.03001
validation_1-logloss:0.15529
                                 validation_1-error:0.04798
[77]
        validation_0-logloss:0.12023
                                         validation_0-error:0.03001
validation_1-logloss:0.15559
                                 validation 1-error:0.04798
[78]
        validation 0-logloss:0.11957
                                         validation 0-error:0.03001
validation 1-logloss:0.15604
                                 validation 1-error:0.04798
        validation 0-logloss:0.11921
                                         validation 0-error:0.03001
[79]
validation_1-logloss:0.15634
                                 validation 1-error:0.04648
        validation_0-logloss:0.11896
                                         validation_0-error:0.03001
[80]
validation_1-logloss:0.15636
                                 validation_1-error:0.04648
        validation_0-logloss:0.11867
                                         validation_0-error:0.03001
[81]
validation_1-logloss:0.15673
                                 validation_1-error:0.04648
        validation_0-logloss:0.11842
                                         validation_0-error:0.03001
[82]
validation_1-logloss:0.15680
                                 validation 1-error:0.04648
[83]
        validation_0-logloss:0.11708
                                         validation_0-error:0.03001
validation_1-logloss:0.15598
                                 validation_1-error:0.04798
        validation_0-logloss:0.11649
                                         validation_0-error:0.02963
validation_1-logloss:0.15519
                                 validation_1-error:0.04498
[85]
        validation_0-logloss:0.11628
                                         validation_0-error:0.02963
validation 1-logloss:0.15528
                                 validation 1-error:0.04498
        validation 0-logloss:0.11563
[86]
                                         validation 0-error:0.02963
validation 1-logloss:0.15504
                                 validation_1-error:0.04498
[87]
        validation_0-logloss:0.11508
                                         validation 0-error:0.02963
validation_1-logloss:0.15429
                                 validation_1-error:0.04498
        validation_0-logloss:0.11478
                                         validation 0-error:0.02963
[88]
validation_1-logloss:0.15418
                                 validation_1-error:0.04498
        validation_0-logloss:0.11403
[89]
                                         validation_0-error:0.02963
validation_1-logloss:0.15449
                                 validation_1-error:0.04498
        validation_0-logloss:0.62126
                                         validation_0-error:0.07014
[0]
validation_1-logloss:0.62301
                                 validation_1-error:0.08696
        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
        validation_0-logloss:0.47133
                                         validation_0-error:0.06639
[3]
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
        validation 0-logloss:0.40360
                                         validation 0-error:0.06602
validation 1-logloss:0.40962
                                 validation 1-error:0.08396
        validation_0-logloss:0.37547
[6]
                                         validation_0-error:0.05551
validation 1-logloss:0.38175
                                 validation 1-error:0.06897
                                         validation_0-error:0.04914
        validation_0-logloss:0.35059
[7]
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
        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
Γ12]
        validation 0-logloss:0.26348
                                         validation 0-error:0.04389
validation 1-logloss:0.27317
                                 validation 1-error:0.05547
        validation 0-logloss:0.25116
                                         validation 0-error:0.04314
[13]
validation_1-logloss:0.26218
                                 validation_1-error:0.05697
        validation_0-logloss:0.24026
                                         validation_0-error:0.04201
[14]
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
        validation_0-logloss:0.22143
                                         validation_0-error:0.04088
[16]
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
        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
        validation 0-logloss:0.19433
[20]
                                         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
        validation_0-logloss:0.18424
                                         validation 0-error:0.03563
[22]
validation_1-logloss:0.19886
                                 validation_1-error:0.05397
        validation_0-logloss:0.17949
[23]
                                         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
        validation_0-logloss:0.15166
                                         validation_0-error:0.03188
[33]
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
        validation 0-logloss:0.14453
                                         validation 0-error:0.03001
[37]
validation_1-logloss:0.16258
                                 validation 1-error:0.04198
        validation_0-logloss:0.14301
                                         validation_0-error:0.03001
[38]
validation_1-logloss:0.16051
                                 validation_1-error:0.04348
        validation_0-logloss:0.14196
                                         validation_0-error:0.03038
[39]
validation_1-logloss:0.16021
                                 validation_1-error:0.04348
        validation_0-logloss:0.14131
                                         validation_0-error:0.03038
[40]
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
        validation_0-logloss:0.13899
[42]
                                         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
        validation 0-logloss:0.13587
Γ441
                                         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
        validation_0-logloss:0.13406
                                         validation 0-error:0.02888
Г461
validation_1-logloss:0.15404
                                 validation_1-error:0.04348
        validation_0-logloss:0.13299
[47]
                                         validation_0-error:0.02851
validation_1-logloss:0.15399
                                 validation_1-error:0.04348
        validation_0-logloss:0.13171
                                         validation_0-error:0.02926
[48]
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
[50]
        validation_0-logloss:0.12976
                                         validation_0-error:0.02851
```

```
validation_1-logloss:0.15265
                                 validation_1-error:0.04048
[51]
        validation_0-logloss:0.12940
                                         validation_0-error:0.02888
validation_1-logloss:0.15282
                                 validation_1-error:0.04048
[52]
        validation_0-logloss:0.12880
                                         validation_0-error:0.02926
validation 1-logloss:0.15241
                                 validation 1-error:0.04048
[53]
        validation 0-logloss:0.12823
                                         validation 0-error:0.02926
validation 1-logloss:0.15268
                                 validation 1-error:0.04048
Γ541
        validation_0-logloss:0.12751
                                         validation_0-error:0.02888
validation 1-logloss:0.15237
                                 validation 1-error:0.04198
[55]
        validation_0-logloss:0.12670
                                         validation_0-error:0.02813
validation_1-logloss:0.15255
                                 validation_1-error:0.04198
[56]
        validation_0-logloss:0.12632
                                         validation_0-error:0.02851
validation_1-logloss:0.15253
                                 validation_1-error:0.04348
        validation_0-logloss:0.12569
                                         validation_0-error:0.02813
[57]
validation_1-logloss:0.15250
                                 validation_1-error:0.04348
[58]
        validation_0-logloss:0.12469
                                         validation_0-error:0.02813
validation_1-logloss:0.15285
                                 validation_1-error:0.04198
[59]
        validation_0-logloss:0.12414
                                         validation_0-error:0.02851
validation_1-logloss:0.15293
                                 validation 1-error:0.04048
[60]
        validation 0-logloss:0.12384
                                         validation 0-error:0.02851
validation 1-logloss:0.15299
                                 validation 1-error:0.04198
        validation 0-logloss:0.12325
                                         validation 0-error:0.02851
[61]
validation_1-logloss:0.15292
                                 validation_1-error:0.04198
        validation_0-logloss:0.12260
                                         validation 0-error:0.02851
[62]
validation_1-logloss:0.15293
                                 validation_1-error:0.04198
        validation_0-logloss:0.12214
                                         validation_0-error:0.02813
[63]
validation_1-logloss:0.15304
                                 validation_1-error:0.04048
        validation_0-logloss:0.12157
[64]
                                         validation_0-error:0.02813
validation_1-logloss:0.15288
                                 validation 1-error:0.03898
[65]
        validation_0-logloss:0.12078
                                         validation_0-error:0.02851
validation_1-logloss:0.15169
                                 validation_1-error:0.03898
        validation_0-logloss:0.12029
                                         validation_0-error:0.02851
validation_1-logloss:0.15202
                                 validation_1-error:0.04048
[67]
        validation_0-logloss:0.12003
                                         validation_0-error:0.02851
validation 1-logloss:0.15188
                                 validation 1-error:0.03898
        validation 0-logloss:0.11946
[68]
                                         validation 0-error:0.02851
validation 1-logloss:0.15183
                                 validation 1-error:0.04198
[69]
        validation_0-logloss:0.11903
                                         validation 0-error:0.02813
validation_1-logloss:0.15159
                                 validation_1-error:0.04198
        validation_0-logloss:0.11876
                                         validation 0-error:0.02813
[70]
validation_1-logloss:0.15148
                                 validation_1-error:0.04198
        validation_0-logloss:0.11829
[71]
                                         validation_0-error:0.02813
validation_1-logloss:0.15154
                                 validation_1-error:0.04198
[72]
        validation_0-logloss:0.11767
                                         validation_0-error:0.02776
validation_1-logloss:0.15063
                                 validation_1-error:0.03748
[73]
        validation_0-logloss:0.11722
                                         validation_0-error:0.02813
validation_1-logloss:0.15075
                                 validation_1-error:0.03748
[74]
        validation_0-logloss:0.11698
                                         validation_0-error:0.02851
```

```
validation_1-logloss:0.15086
                                validation_1-error:0.03748
        validation_0-logloss:0.11640
                                         validation_0-error:0.02776
[75]
validation_1-logloss:0.15089
                                validation_1-error:0.03898
        validation 0-logloss:0.11593
                                         validation_0-error:0.02813
[76]
validation 1-logloss:0.15070
                                validation 1-error:0.04048
        validation 0-logloss:0.11572
                                         validation 0-error:0.02813
[77]
validation 1-logloss:0.15089
                                validation 1-error:0.04048
[78]
        validation_0-logloss:0.11494
                                         validation 0-error:0.02813
validation 1-logloss:0.15012
                                validation 1-error:0.03748
[79]
        validation_0-logloss:0.11447
                                         validation_0-error:0.02813
validation_1-logloss:0.14952
                                validation_1-error:0.03748
        validation_0-logloss:0.11416
                                         validation_0-error:0.02776
[80]
validation_1-logloss:0.14954
                                validation_1-error:0.03748
        validation_0-logloss:0.11384
                                        validation 0-error:0.02776
validation_1-logloss:0.14984
                                validation_1-error:0.03748
[82]
        validation_0-logloss:0.11322
                                         validation_0-error:0.02776
validation_1-logloss:0.14966
                                validation_1-error:0.03748
        validation_0-logloss:0.11274
                                        validation_0-error:0.02738
[83]
validation 1-logloss:0.14929
                                validation 1-error:0.03748
Г841
        validation 0-logloss:0.11244
                                         validation 0-error:0.02738
validation 1-logloss:0.14916
                                validation 1-error:0.03748
        validation 0-logloss:0.11227
                                         validation 0-error:0.02738
[85]
validation_1-logloss:0.14936
                                validation 1-error:0.03748
        validation_0-logloss:0.11163
                                         validation_0-error:0.02738
[86]
validation_1-logloss:0.14922
                                validation_1-error:0.03748
        validation_0-logloss:0.11118
                                         validation_0-error:0.02738
[87]
validation_1-logloss:0.14920
                                validation_1-error:0.03748
        validation_0-logloss:0.11086
[88]
                                        validation_0-error:0.02738
validation_1-logloss:0.14966
                                validation 1-error:0.03898
        validation_0-logloss:0.11034
                                         validation_0-error:0.02776
validation_1-logloss:0.14977
                                validation_1-error:0.03748
        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
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:0.56152
                                        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
        validation_0-logloss:0.46992
                                         validation_0-error:0.07089
[3]
validation_1-logloss:0.47802
                                 validation 1-error:0.09145
        validation 0-logloss:0.43456
                                         validation 0-error:0.07089
[4]
validation 1-logloss:0.44444
                                 validation 1-error:0.09145
        validation 0-logloss:0.40339
                                         validation 0-error:0.07089
                                 validation 1-error:0.09145
validation_1-logloss:0.41329
        validation_0-logloss:0.37649
                                         validation 0-error:0.07052
                                 validation_1-error:0.09145
validation_1-logloss:0.38790
        validation_0-logloss:0.35303
                                         validation_0-error:0.05701
[7]
validation_1-logloss:0.36487
                                 validation_1-error:0.07046
        validation_0-logloss:0.33127
                                         validation_0-error:0.05664
validation_1-logloss:0.34306
                                 validation 1-error:0.07346
        validation_0-logloss:0.31199
[9]
                                         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
        validation 0-logloss:0.26394
                                         validation 0-error:0.05176
validation 1-logloss:0.27842
                                 validation 1-error:0.06897
        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
        validation_0-logloss:0.23183
                                         validation_0-error:0.04351
[15]
validation_1-logloss:0.24820
                                 validation_1-error:0.06147
        validation_0-logloss:0.22302
[16]
                                         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
        validation_0-logloss:0.20882
[18]
                                         validation_0-error:0.04088
validation 1-logloss:0.22700
                                 validation 1-error:0.05697
        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
        validation_0-logloss:0.19236
                                         validation_0-error:0.04126
[21]
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
        validation_0-logloss:0.17978
[24]
                                         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
        validation_0-logloss:0.16894
                                         validation_0-error:0.03676
[27]
validation_1-logloss:0.19116
                                 validation 1-error:0.05097
        validation 0-logloss:0.16582
                                         validation 0-error:0.03713
Γ281
validation 1-logloss:0.18705
                                 validation 1-error:0.04947
        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
        validation_0-logloss:0.15879
                                         validation_0-error:0.03601
[31]
validation_1-logloss:0.18042
                                 validation_1-error:0.04798
        validation_0-logloss:0.15660
                                         validation_0-error:0.03601
[32]
validation_1-logloss:0.17792
                                 validation 1-error:0.04798
        validation_0-logloss:0.15479
[33]
                                         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
        validation 0-logloss:0.15026
                                         validation 0-error:0.03488
validation 1-logloss:0.17438
                                 validation 1-error:0.04798
        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
        validation 0-logloss:0.14204
                                         validation 0-error:0.03338
validation 1-logloss:0.17121
                                 validation 1-error:0.04798
        validation 0-logloss:0.14062
                                         validation 0-error:0.03226
[44]
validation_1-logloss:0.17064
                                 validation 1-error:0.04798
        validation_0-logloss:0.13999
                                         validation_0-error:0.03263
[45]
validation_1-logloss:0.17061
                                 validation 1-error:0.04798
        validation_0-logloss:0.13900
                                         validation_0-error:0.03226
[46]
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
        validation_0-logloss:0.13763
[48]
                                         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
```

```
[50]
        validation_0-logloss:0.13578
                                         validation_0-error:0.03113
validation_1-logloss:0.16977
                                 validation_1-error:0.04648
        validation_0-logloss:0.13511
[51]
                                         validation_0-error:0.03113
validation_1-logloss:0.16946
                                 validation 1-error:0.04498
Γ521
        validation 0-logloss:0.13395
                                         validation 0-error:0.03113
validation 1-logloss:0.16801
                                 validation 1-error:0.04498
        validation 0-logloss:0.13264
                                         validation 0-error:0.03113
validation_1-logloss:0.16756
                                 validation 1-error:0.04498
[54]
        validation_0-logloss:0.13213
                                         validation 0-error:0.03076
validation_1-logloss:0.16739
                                 validation_1-error:0.04498
        validation_0-logloss:0.13133
                                         validation_0-error:0.03076
[55]
validation_1-logloss:0.16786
                                 validation_1-error:0.04498
        validation_0-logloss:0.13032
                                         validation_0-error:0.03076
[56]
validation_1-logloss:0.16766
                                 validation 1-error:0.04498
        validation_0-logloss:0.12966
[57]
                                         validation_0-error:0.03076
validation_1-logloss:0.16700
                                 validation_1-error:0.04498
[58]
        validation_0-logloss:0.12851
                                         validation_0-error:0.03038
validation_1-logloss:0.16731
                                 validation_1-error:0.04648
[59]
        validation_0-logloss:0.12808
                                         validation_0-error:0.03076
validation 1-logloss:0.16758
                                 validation 1-error:0.04648
        validation_0-logloss:0.12740
                                         validation 0-error:0.03038
validation 1-logloss:0.16668
                                 validation 1-error:0.04798
[61]
        validation_0-logloss:0.12689
                                         validation_0-error:0.03038
validation_1-logloss:0.16671
                                 validation_1-error:0.04798
[62]
        validation_0-logloss:0.12586
                                         validation_0-error:0.03038
validation_1-logloss:0.16611
                                 validation_1-error:0.04798
        validation_0-logloss:0.12544
                                         validation_0-error:0.03001
[63]
validation_1-logloss:0.16656
                                 validation_1-error:0.04798
[64]
        validation_0-logloss:0.12502
                                         validation_0-error:0.03001
validation_1-logloss:0.16654
                                 validation_1-error:0.04798
[65]
        validation_0-logloss:0.12431
                                         validation_0-error:0.03001
validation_1-logloss:0.16622
                                 validation_1-error:0.04798
[66]
        validation_0-logloss:0.12375
                                         validation_0-error:0.03001
validation_1-logloss:0.16614
                                 validation 1-error:0.04798
        validation 0-logloss:0.12289
                                         validation 0-error:0.03001
validation 1-logloss:0.16614
                                 validation 1-error:0.04648
        validation 0-logloss:0.12246
                                         validation 0-error:0.03001
[68]
validation_1-logloss:0.16593
                                 validation 1-error:0.04648
        validation_0-logloss:0.12178
                                         validation_0-error:0.03001
[69]
validation_1-logloss:0.16574
                                 validation 1-error:0.04648
        validation_0-logloss:0.12109
                                         validation_0-error:0.02926
[70]
validation_1-logloss:0.16563
                                 validation_1-error:0.04648
[71]
        validation_0-logloss:0.12073
                                         validation_0-error:0.02963
validation_1-logloss:0.16564
                                 validation 1-error:0.04648
        validation_0-logloss:0.12026
[72]
                                         validation_0-error:0.02963
validation_1-logloss:0.16605
                                 validation_1-error:0.04648
[73]
        validation_0-logloss:0.11978
                                         validation_0-error:0.03001
validation_1-logloss:0.16588
                                 validation_1-error:0.04648
```

```
[74]
        validation_0-logloss:0.11942
                                         validation_0-error:0.03001
validation_1-logloss:0.16601
                                validation_1-error:0.04648
        validation_0-logloss:0.11896
                                         validation_0-error:0.03001
[75]
validation_1-logloss:0.16597
                                validation 1-error:0.04648
        validation 0-logloss:0.11812
                                         validation 0-error:0.02963
[76]
validation 1-logloss:0.16545
                                validation 1-error:0.04648
        validation 0-logloss:0.11774
                                         validation 0-error:0.02926
validation_1-logloss:0.16550
                                 validation 1-error:0.04648
[78]
        validation_0-logloss:0.11729
                                         validation 0-error:0.02888
                                validation_1-error:0.04798
validation_1-logloss:0.16509
        validation_0-logloss:0.11713
                                         validation_0-error:0.02888
[79]
validation_1-logloss:0.16505
                                validation_1-error:0.04648
        validation_0-logloss:0.11656
                                         validation_0-error:0.02888
[80]
validation_1-logloss:0.16578
                                validation 1-error:0.04648
        validation_0-logloss:0.11611
[81]
                                         validation_0-error:0.02851
validation_1-logloss:0.16557
                                validation_1-error:0.04648
[82]
        validation_0-logloss:0.11546
                                         validation_0-error:0.02851
validation_1-logloss:0.16580
                                validation_1-error:0.04648
[83]
        validation 0-logloss:0.11534
                                         validation_0-error:0.02888
validation 1-logloss:0.16557
                                validation 1-error:0.04648
        validation 0-logloss:0.11491
                                         validation 0-error:0.02888
validation 1-logloss:0.16540
                                validation 1-error:0.04498
        validation_0-logloss:0.11462
                                         validation_0-error:0.02888
validation_1-logloss:0.16548
                                validation_1-error:0.04498
[86]
        validation_0-logloss:0.11426
                                         validation_0-error:0.02851
validation_1-logloss:0.16549
                                validation_1-error:0.04648
[87]
        validation_0-logloss:0.11393
                                         validation_0-error:0.02813
validation_1-logloss:0.16531
                                validation_1-error:0.04648
        validation_0-logloss:0.11343
[88]
                                         validation_0-error:0.02813
validation_1-logloss:0.16542
                                validation_1-error:0.04648
[89]
        validation_0-logloss:0.11305
                                         validation_0-error:0.02813
validation_1-logloss:0.16596
                                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
        validation 0-logloss:0.56311
                                         validation 0-error:0.05664
validation 1-logloss:0.56579
                                validation 1-error:0.06597
        validation 0-logloss:0.51379
                                         validation 0-error:0.06977
validation_1-logloss:0.51841
                                validation 1-error:0.08846
        validation_0-logloss:0.47240
                                         validation_0-error:0.05664
[3]
validation_1-logloss:0.47782
                                validation 1-error:0.06597
        validation_0-logloss:0.43691
                                         validation_0-error:0.05664
[4]
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
        validation_0-logloss:0.37956
[6]
                                         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
        validation_0-logloss:0.31230
                                         validation_0-error:0.05476
[9]
validation_1-logloss:0.32146
                                 validation 1-error:0.06747
Γ107
        validation 0-logloss:0.29549
                                         validation 0-error:0.05439
validation 1-logloss:0.30510
                                 validation 1-error:0.06597
        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-error:0.05697
validation_1-logloss:0.27683
        validation_0-logloss:0.25365
                                         validation_0-error:0.04276
[13]
validation_1-logloss:0.26489
                                 validation_1-error:0.05547
        validation_0-logloss:0.24251
                                         validation_0-error:0.04314
[14]
validation_1-logloss:0.25425
                                 validation 1-error:0.05697
        validation_0-logloss:0.23283
[15]
                                         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
        validation_0-logloss:0.20889
                                         validation 0-error:0.04314
validation 1-logloss:0.22285
                                 validation 1-error:0.05547
        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
        validation_0-logloss:0.19081
                                         validation_0-error:0.03751
[21]
validation_1-logloss:0.20392
                                 validation_1-error:0.04947
        validation_0-logloss:0.18632
[22]
                                         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-error:0.05397
validation_1-logloss:0.19678
        validation_0-logloss:0.17813
[24]
                                         validation_0-error:0.03638
validation 1-logloss:0.19398
                                 validation 1-error:0.05397
        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
        validation_0-logloss:0.16745
                                         validation_0-error:0.03638
[27]
validation_1-logloss:0.18251
                                 validation 1-error:0.05097
        validation_0-logloss:0.16436
                                         validation_0-error:0.03638
[28]
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
        validation_0-logloss:0.15988
[30]
                                         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
        validation_0-logloss:0.15457
                                         validation_0-error:0.03638
[33]
validation_1-logloss:0.17233
                                 validation 1-error:0.04947
        validation 0-logloss:0.15319
                                         validation 0-error:0.03601
Γ341
validation 1-logloss:0.17087
                                 validation 1-error:0.04947
        validation 0-logloss:0.15194
                                         validation 0-error:0.03526
validation_1-logloss:0.17028
                                 validation 1-error:0.04947
        validation_0-logloss:0.14993
                                         validation 0-error:0.03451
[36]
validation_1-logloss:0.16912
                                 validation_1-error:0.04798
        validation_0-logloss:0.14894
                                         validation_0-error:0.03413
[37]
validation_1-logloss:0.16899
                                 validation_1-error:0.04947
        validation_0-logloss:0.14718
                                         validation_0-error:0.03376
[38]
validation_1-logloss:0.16758
                                 validation_1-error:0.04947
        validation_0-logloss:0.14562
[39]
                                         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
        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-error:0.04648
validation_1-logloss:0.16395
[48]
        validation_0-logloss:0.13683
                                         validation_0-error:0.03301
validation 1-logloss:0.16326
                                 validation 1-error:0.04648
        validation 0-logloss:0.13557
                                         validation 0-error:0.03301
validation 1-logloss:0.16265
                                 validation 1-error:0.04648
        validation 0-logloss:0.13529
                                         validation 0-error:0.03301
[50]
validation_1-logloss:0.16291
                                 validation 1-error:0.04648
        validation_0-logloss:0.13422
                                         validation_0-error:0.03226
[51]
validation_1-logloss:0.16253
                                 validation 1-error:0.04648
        validation_0-logloss:0.13301
                                         validation_0-error:0.03263
[52]
validation_1-logloss:0.16242
                                 validation_1-error:0.04648
[53]
        validation_0-logloss:0.13198
                                         validation_0-error:0.03226
validation_1-logloss:0.16247
                                 validation 1-error:0.04648
        validation_0-logloss:0.13155
[54]
                                         validation_0-error:0.03226
validation_1-logloss:0.16256
                                 validation_1-error:0.04648
[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
        validation_0-logloss:0.12970
                                         validation_0-error:0.03226
[57]
validation_1-logloss:0.16181
                                 validation 1-error:0.04648
        validation 0-logloss:0.12913
                                         validation 0-error:0.03263
Γ581
validation 1-logloss:0.16138
                                 validation 1-error:0.04648
        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-error:0.04648
validation_1-logloss:0.16055
        validation_0-logloss:0.12726
                                         validation_0-error:0.03151
[61]
validation_1-logloss:0.16087
                                 validation_1-error:0.04648
        validation_0-logloss:0.12678
                                         validation_0-error:0.03113
[62]
validation_1-logloss:0.16136
                                 validation 1-error:0.04648
        validation_0-logloss:0.12646
[63]
                                         validation_0-error:0.03076
validation_1-logloss:0.16152
                                 validation_1-error:0.04648
[64]
        validation_0-logloss:0.12616
                                         validation_0-error:0.03076
validation_1-logloss:0.16160
                                 validation_1-error:0.04648
[65]
        validation 0-logloss:0.12580
                                         validation_0-error:0.03113
validation 1-logloss:0.16155
                                 validation 1-error:0.04648
        validation 0-logloss:0.12525
                                         validation 0-error:0.03113
validation 1-logloss:0.16162
                                 validation 1-error:0.04648
        validation_0-logloss:0.12489
                                         validation_0-error:0.03113
validation_1-logloss:0.16140
                                 validation 1-error:0.04648
[68]
        validation_0-logloss:0.12448
                                         validation_0-error:0.03113
validation_1-logloss:0.16145
                                 validation_1-error:0.04498
        validation_0-logloss:0.12414
[69]
                                         validation_0-error:0.03113
validation_1-logloss:0.16156
                                 validation_1-error:0.04498
        validation_0-logloss:0.12376
[70]
                                         validation 0-error:0.03038
validation_1-logloss:0.16165
                                 validation_1-error:0.04498
[71]
        validation_0-logloss:0.12343
                                         validation_0-error:0.03038
validation_1-logloss:0.16182
                                 validation_1-error:0.04498
                                         validation_0-error:0.03038
[72]
        validation_0-logloss:0.12237
validation 1-logloss:0.16213
                                 validation 1-error:0.04498
        validation 0-logloss:0.12186
                                         validation 0-error:0.03001
validation 1-logloss:0.16182
                                 validation 1-error:0.04498
        validation 0-logloss:0.12149
                                         validation 0-error:0.03001
[74]
validation_1-logloss:0.16218
                                 validation 1-error:0.04498
        validation_0-logloss:0.12125
                                         validation_0-error:0.03001
[75]
validation_1-logloss:0.16278
                                 validation 1-error:0.04498
        validation_0-logloss:0.12079
                                         validation_0-error:0.03001
[76]
                                 validation_1-error:0.04498
validation_1-logloss:0.16288
[77]
        validation_0-logloss:0.12048
                                         validation_0-error:0.03038
validation_1-logloss:0.16251
                                 validation 1-error:0.04648
        validation_0-logloss:0.12008
[78]
                                         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
```

```
[08]
        validation_0-logloss:0.11940
                                        validation_0-error:0.03001
validation_1-logloss:0.16272
                                validation_1-error:0.04648
        validation_0-logloss:0.11911
                                        validation_0-error:0.03001
[81]
validation 1-logloss:0.16278
                                validation 1-error:0.04648
        validation 0-logloss:0.11878
                                         validation 0-error:0.02926
[82]
validation 1-logloss:0.16300
                                validation 1-error:0.04648
        validation 0-logloss:0.11832
                                         validation_0-error:0.02926
validation_1-logloss:0.16311
                                validation 1-error:0.04648
        validation_0-logloss:0.11805
                                         validation 0-error:0.02926
[84]
validation_1-logloss:0.16321
                                validation_1-error:0.04648
        validation_0-logloss:0.11718
[85]
                                         validation_0-error:0.03001
validation_1-logloss:0.16360
                                validation_1-error:0.04498
        validation_0-logloss:0.11701
                                         validation_0-error:0.02963
[86]
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
validation_1-logloss:0.16367
                                validation_1-error:0.04498
        validation 0-logloss:0.11569
                                         validation_0-error:0.02926
[89]
validation 1-logloss:0.16395
                                validation 1-error:0.04498
        validation 0-logloss:0.62188
                                         validation 0-error:0.07277
validation 1-logloss:0.62394
                                validation 1-error:0.08546
        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
        validation_0-logloss:0.47256
                                         validation_0-error:0.05851
validation_1-logloss:0.47799
                                validation_1-error:0.06897
                                         validation_0-error:0.05851
        validation_0-logloss:0.43700
[4]
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)
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:0.40644
                                        validation_0-error:0.05664
validation_1-logloss:0.41402
                                validation_1-error:0.07046
        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
        validation_0-logloss:0.33442
                                         validation_0-error:0.05626
[8]
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
        validation 0-logloss:0.29682
                                         validation 0-error:0.05664
[10]
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
                                         validation_0-error:0.05026
[12]
        validation_0-logloss:0.26661
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
        validation_0-logloss:0.24311
                                         validation_0-error:0.04389
[14]
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
Γ17]
        validation 0-logloss:0.21588
                                         validation 0-error:0.04013
validation 1-logloss:0.22683
                                 validation 1-error:0.04648
        validation 0-logloss:0.20914
                                         validation 0-error:0.03826
[18]
validation_1-logloss:0.22003
                                 validation_1-error:0.04648
        validation_0-logloss:0.20245
                                         validation 0-error:0.03713
[19]
validation_1-logloss:0.21410
                                 validation_1-error:0.04648
        validation_0-logloss:0.19661
                                         validation_0-error:0.03864
[20]
validation_1-logloss:0.20888
                                 validation_1-error:0.04498
        validation_0-logloss:0.19040
[21]
                                         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
        validation_0-logloss:0.18178
[23]
                                         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
        validation 0-logloss:0.17340
[25]
                                         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
        validation_0-logloss:0.16617
[27]
                                         validation 0-error:0.03488
validation_1-logloss:0.17803
                                 validation_1-error:0.03598
        validation_0-logloss:0.16327
                                         validation_0-error:0.03413
[28]
validation_1-logloss:0.17492
                                 validation_1-error:0.03598
        validation_0-logloss:0.16052
                                         validation_0-error:0.03376
[29]
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
                                         validation_0-error:0.03226
[36]
        validation_0-logloss:0.14678
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
        validation_0-logloss:0.14368
                                         validation_0-error:0.03151
[38]
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
Γ417
        validation 0-logloss:0.14042
                                         validation 0-error:0.03076
validation 1-logloss:0.15443
                                 validation 1-error:0.03448
        validation 0-logloss:0.13902
                                         validation 0-error:0.03076
[42]
validation_1-logloss:0.15348
                                 validation 1-error:0.03448
        validation_0-logloss:0.13758
                                         validation_0-error:0.03076
[43]
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
        validation_0-logloss:0.13546
                                         validation_0-error:0.03076
[45]
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
        validation_0-logloss:0.13388
[47]
                                         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
        validation 0-logloss:0.13177
[49]
                                         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
        validation_0-logloss:0.13062
                                         validation 0-error:0.03001
[51]
validation_1-logloss:0.15225
                                 validation_1-error:0.03448
        validation_0-logloss:0.12971
[52]
                                         validation_0-error:0.03001
validation_1-logloss:0.15133
                                 validation_1-error:0.03448
        validation_0-logloss:0.12924
                                         validation_0-error:0.03001
[53]
validation_1-logloss:0.15081
                                 validation_1-error:0.03448
        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
                                         validation_0-error:0.02926
        validation_0-logloss:0.12537
[60]
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
        validation_0-logloss:0.12330
                                         validation_0-error:0.02888
[62]
validation_1-logloss:0.14814
                                 validation_1-error:0.03148
[63]
        validation_0-logloss:0.12269
                                         validation_0-error:0.02888
validation_1-logloss:0.14811
                                 validation_1-error:0.03148
[64]
        validation_0-logloss:0.12232
                                         validation_0-error:0.02888
validation_1-logloss:0.14797
                                 validation 1-error:0.03148
[65]
        validation 0-logloss:0.12195
                                         validation 0-error:0.02851
validation 1-logloss:0.14778
                                 validation 1-error:0.03148
        validation 0-logloss:0.12147
                                         validation 0-error:0.02851
[66]
validation_1-logloss:0.14816
                                 validation 1-error:0.03148
        validation_0-logloss:0.12093
                                         validation_0-error:0.02851
[67]
validation_1-logloss:0.14827
                                 validation_1-error:0.03148
        validation_0-logloss:0.12059
                                         validation_0-error:0.02813
[68]
validation_1-logloss:0.14823
                                 validation_1-error:0.03148
        validation_0-logloss:0.12011
                                         validation_0-error:0.02813
[69]
validation_1-logloss:0.14752
                                 validation 1-error:0.03148
[70]
        validation_0-logloss:0.11912
                                         validation_0-error:0.02851
validation_1-logloss:0.14694
                                 validation_1-error:0.03148
        validation_0-logloss:0.11880
[71]
                                         validation_0-error:0.02813
validation_1-logloss:0.14683
                                 validation_1-error:0.03148
[72]
        validation_0-logloss:0.11821
                                         validation_0-error:0.02776
validation 1-logloss:0.14675
                                 validation 1-error:0.03148
        validation 0-logloss:0.11788
[73]
                                         validation 0-error:0.02776
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
        validation_0-logloss:0.11690
                                         validation_0-error:0.02813
[75]
validation_1-logloss:0.14575
                                 validation_1-error:0.03148
        validation_0-logloss:0.11624
[76]
                                         validation_0-error:0.02813
validation_1-logloss:0.14617
                                 validation_1-error:0.03148
[77]
        validation_0-logloss:0.11575
                                         validation_0-error:0.02776
validation_1-logloss:0.14628
                                 validation_1-error:0.03148
[78]
        validation_0-logloss:0.11523
                                         validation_0-error:0.02776
validation_1-logloss:0.14583
                                 validation_1-error:0.03148
[79]
        validation_0-logloss:0.11457
                                         validation_0-error:0.02738
```

```
validation_1-logloss:0.14564
                                 validation_1-error:0.03148
[80]
        validation_0-logloss:0.11414
                                         validation_0-error:0.02701
validation_1-logloss:0.14574
                                 validation_1-error:0.03148
[81]
        validation_0-logloss:0.11375
                                         validation_0-error:0.02701
validation 1-logloss:0.14571
                                 validation 1-error:0.03148
[82]
        validation 0-logloss:0.11321
                                         validation 0-error:0.02626
validation 1-logloss:0.14537
                                 validation 1-error:0.03148
[83]
        validation_0-logloss:0.11224
                                         validation_0-error:0.02663
validation 1-logloss:0.14488
                                 validation 1-error:0.03148
[84]
        validation_0-logloss:0.11182
                                         validation_0-error:0.02663
validation_1-logloss:0.14514
                                 validation_1-error:0.03148
[85]
        validation_0-logloss:0.11141
                                         validation_0-error:0.02588
validation_1-logloss:0.14466
                                 validation_1-error:0.03148
        validation_0-logloss:0.11102
                                         validation_0-error:0.02588
[86]
validation_1-logloss:0.14483
                                 validation_1-error:0.03148
[87]
        validation_0-logloss:0.11036
                                         validation_0-error:0.02551
validation_1-logloss:0.14521
                                 validation_1-error:0.03148
[88]
        validation_0-logloss:0.11009
                                         validation_0-error:0.02551
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
        validation 0-logloss:0.10931
                                         validation 0-error:0.02551
[90]
validation_1-logloss:0.14525
                                 validation 1-error:0.03298
        validation_0-logloss:0.10905
                                         validation_0-error:0.02513
[91]
validation_1-logloss:0.14506
                                 validation_1-error:0.03298
[92]
        validation_0-logloss:0.10856
                                         validation_0-error:0.02476
validation_1-logloss:0.14495
                                 validation_1-error:0.03298
        validation_0-logloss:0.10823
[93]
                                         validation_0-error:0.02476
validation_1-logloss:0.14458
                                 validation 1-error:0.03298
[94]
        validation_0-logloss:0.10716
                                         validation_0-error:0.02513
validation_1-logloss:0.14439
                                 validation_1-error:0.03298
        validation_0-logloss:0.10686
[95]
                                         validation_0-error:0.02513
validation_1-logloss:0.14422
                                 validation_1-error:0.03298
[96]
        validation_0-logloss:0.10645
                                         validation_0-error:0.02513
validation 1-logloss:0.14390
                                 validation 1-error:0.03298
        validation 0-logloss:0.10630
[97]
                                         validation 0-error:0.02513
validation 1-logloss:0.14374
                                 validation 1-error:0.03298
[98]
        validation_0-logloss:0.10555
                                         validation 0-error:0.02513
validation_1-logloss:0.14354
                                 validation_1-error:0.03298
        validation_0-logloss:0.10537
[99]
                                         validation_0-error:0.02513
validation_1-logloss:0.14362
                                 validation_1-error:0.03298
        validation_0-logloss:0.10471
[100]
                                         validation_0-error:0.02476
validation_1-logloss:0.14333
                                 validation_1-error:0.03448
        validation_0-logloss:0.10411
                                         validation_0-error:0.02438
[101]
validation_1-logloss:0.14308
                                 validation_1-error:0.03448
[102]
        validation_0-logloss:0.10396
                                         validation_0-error:0.02476
validation_1-logloss:0.14315
                                 validation_1-error:0.03448
[103]
        validation_0-logloss:0.10353
                                         validation_0-error:0.02513
```

```
validation_1-logloss:0.14321
                                 validation_1-error:0.03448
        validation_0-logloss:0.10289
                                         validation_0-error:0.02513
[104]
validation_1-logloss:0.14315
                                 validation_1-error:0.03448
[105]
        validation_0-logloss:0.10250
                                         validation_0-error:0.02513
validation 1-logloss:0.14316
                                 validation 1-error:0.03448
[106]
        validation 0-logloss:0.10189
                                         validation 0-error:0.02476
validation 1-logloss:0.14306
                                 validation 1-error:0.03448
[107]
        validation_0-logloss:0.10161
                                         validation_0-error:0.02513
validation 1-logloss:0.14313
                                 validation 1-error:0.03448
[108]
        validation_0-logloss:0.10112
                                         validation_0-error:0.02476
validation_1-logloss:0.14318
                                 validation_1-error:0.03448
[109]
        validation_0-logloss:0.10060
                                         validation_0-error:0.02513
validation_1-logloss:0.14303
                                 validation_1-error:0.03448
        validation_0-logloss:0.10038
                                         validation_0-error:0.02513
[110]
validation_1-logloss:0.14329
                                 validation_1-error:0.03448
        validation_0-logloss:0.09994
                                         validation_0-error:0.02513
[111]
validation_1-logloss:0.14313
                                 validation_1-error:0.03448
[112]
        validation_0-logloss:0.09973
                                         validation_0-error:0.02476
validation 1-logloss:0.14352
                                 validation 1-error:0.03448
Γ1137
        validation 0-logloss:0.09923
                                         validation 0-error:0.02476
validation 1-logloss:0.14350
                                 validation 1-error:0.03448
        validation 0-logloss:0.09892
[114]
                                         validation 0-error:0.02476
validation_1-logloss:0.14355
                                 validation_1-error:0.03448
        validation_0-logloss:0.09845
                                         validation_0-error:0.02513
[115]
validation_1-logloss:0.14349
                                 validation_1-error:0.03448
        validation_0-logloss:0.09827
                                         validation_0-error:0.02513
[116]
validation_1-logloss:0.14318
                                 validation_1-error:0.03448
        validation_0-logloss:0.09795
[117]
                                         validation_0-error:0.02513
validation_1-logloss:0.14321
                                 validation 1-error:0.03448
[118]
        validation_0-logloss:0.09750
                                         validation_0-error:0.02476
validation_1-logloss:0.14317
                                 validation_1-error:0.03448
        validation_0-logloss:0.09727
[119]
                                         validation_0-error:0.02476
validation_1-logloss:0.14331
                                 validation_1-error:0.03448
[0]
        validation_0-logloss:0.62140
                                         validation_0-error:0.07164
validation 1-logloss:0.62313
                                 validation 1-error:0.09145
        validation 0-logloss:0.56265
[1]
                                         validation 0-error:0.05476
validation 1-logloss:0.56447
                                 validation 1-error:0.05997
        validation_0-logloss:0.51301
                                         validation 0-error:0.06489
[2]
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
        validation_0-logloss:0.43558
                                         validation_0-error:0.05251
[4]
validation_1-logloss:0.44073
                                 validation_1-error:0.05397
        validation_0-logloss:0.40492
                                         validation_0-error:0.05214
[5]
validation_1-logloss:0.41100
                                 validation_1-error:0.06297
        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
        validation_0-logloss:0.33367
                                         validation_0-error:0.05251
[8]
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
        validation 0-logloss:0.29648
                                         validation 0-error:0.05214
[10]
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
                                         validation_0-error:0.05139
[12]
        validation_0-logloss:0.26654
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
        validation_0-logloss:0.24327
                                         validation_0-error:0.04876
[14]
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
Γ17]
        validation 0-logloss:0.21706
                                         validation 0-error:0.04126
validation 1-logloss:0.22859
                                 validation 1-error:0.05397
        validation 0-logloss:0.20897
                                         validation 0-error:0.04088
[18]
validation_1-logloss:0.21887
                                 validation_1-error:0.04947
        validation_0-logloss:0.20263
                                         validation 0-error:0.03901
[19]
validation_1-logloss:0.21278
                                 validation_1-error:0.04798
        validation_0-logloss:0.19688
                                         validation_0-error:0.03939
[20]
validation_1-logloss:0.20793
                                 validation_1-error:0.04798
        validation_0-logloss:0.19088
[21]
                                         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
        validation_0-logloss:0.18158
[23]
                                         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
        validation 0-logloss:0.17408
[25]
                                         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
        validation_0-logloss:0.16809
                                         validation 0-error:0.03563
[27]
validation_1-logloss:0.17806
                                 validation_1-error:0.04498
        validation_0-logloss:0.16530
                                         validation_0-error:0.03526
[28]
validation_1-logloss:0.17593
                                 validation_1-error:0.04348
        validation_0-logloss:0.16310
                                         validation_0-error:0.03526
[29]
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
        validation_0-logloss:0.14710
                                         validation_0-error:0.03413
[38]
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
Γ417
        validation 0-logloss:0.14303
                                         validation 0-error:0.03376
validation 1-logloss:0.16121
                                 validation 1-error:0.04498
        validation 0-logloss:0.14187
                                         validation 0-error:0.03376
[42]
validation_1-logloss:0.16082
                                 validation 1-error:0.04498
        validation_0-logloss:0.14052
                                         validation_0-error:0.03338
[43]
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
        validation_0-logloss:0.13811
[45]
                                         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
        validation_0-logloss:0.13585
[47]
                                         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
        validation 0-logloss:0.13440
[49]
                                         validation 0-error:0.03263
validation 1-logloss:0.15830
                                 validation 1-error:0.04348
[50]
        validation_0-logloss:0.13348
                                         validation 0-error:0.03188
validation_1-logloss:0.15812
                                 validation_1-error:0.04348
        validation_0-logloss:0.13285
                                         validation 0-error:0.03188
[51]
validation_1-logloss:0.15773
                                 validation_1-error:0.04348
        validation_0-logloss:0.13224
[52]
                                         validation_0-error:0.03188
validation_1-logloss:0.15687
                                 validation_1-error:0.04348
        validation_0-logloss:0.13183
                                         validation_0-error:0.03188
[53]
validation_1-logloss:0.15725
                                 validation_1-error:0.04348
[54]
        validation_0-logloss:0.13106
                                         validation_0-error:0.03188
validation_1-logloss:0.15727
                                 validation_1-error:0.04348
[55]
        validation_0-logloss:0.13065
                                         validation_0-error:0.03151
```

```
validation_1-logloss:0.15726
                                 validation_1-error:0.04348
[56]
        validation_0-logloss:0.13011
                                         validation_0-error:0.03113
validation_1-logloss:0.15682
                                 validation_1-error:0.04198
[57]
        validation_0-logloss:0.12963
                                         validation_0-error:0.03113
validation 1-logloss:0.15642
                                 validation 1-error:0.04198
        validation 0-logloss:0.12916
                                         validation 0-error:0.03076
[58]
validation 1-logloss:0.15614
                                 validation 1-error:0.04348
[59]
        validation_0-logloss:0.12870
                                         validation_0-error:0.03113
validation 1-logloss:0.15610
                                 validation 1-error:0.04198
[60]
        validation_0-logloss:0.12822
                                         validation_0-error:0.03113
validation_1-logloss:0.15665
                                 validation_1-error:0.04498
[61]
        validation_0-logloss:0.12779
                                         validation_0-error:0.03113
validation_1-logloss:0.15670
                                 validation_1-error:0.04348
        validation_0-logloss:0.12699
                                         validation_0-error:0.03113
[62]
validation_1-logloss:0.15622
                                 validation_1-error:0.04348
[63]
        validation_0-logloss:0.12662
                                         validation_0-error:0.03113
validation_1-logloss:0.15601
                                 validation_1-error:0.04348
[64]
        validation_0-logloss:0.12622
                                         validation_0-error:0.03113
validation_1-logloss:0.15619
                                 validation 1-error:0.04498
[65]
        validation 0-logloss:0.12544
                                         validation 0-error:0.03076
validation 1-logloss:0.15618
                                 validation 1-error:0.04498
        validation 0-logloss:0.12475
                                         validation 0-error:0.03076
[66]
validation_1-logloss:0.15593
                                 validation 1-error:0.04498
        validation_0-logloss:0.12440
                                         validation_0-error:0.03076
[67]
validation_1-logloss:0.15605
                                 validation_1-error:0.04498
        validation_0-logloss:0.12396
                                         validation_0-error:0.03076
[68]
validation_1-logloss:0.15599
                                 validation_1-error:0.04498
        validation_0-logloss:0.12365
[69]
                                         validation_0-error:0.03076
validation_1-logloss:0.15593
                                 validation 1-error:0.04648
[70]
        validation_0-logloss:0.12291
                                         validation_0-error:0.03076
validation_1-logloss:0.15541
                                 validation_1-error:0.04498
        validation_0-logloss:0.12251
[71]
                                         validation_0-error:0.03076
validation_1-logloss:0.15599
                                 validation_1-error:0.04648
[72]
        validation_0-logloss:0.12185
                                         validation_0-error:0.03038
validation 1-logloss:0.15585
                                 validation 1-error:0.04648
        validation 0-logloss:0.12168
[73]
                                         validation 0-error:0.03038
validation 1-logloss:0.15603
                                 validation_1-error:0.04798
[74]
        validation_0-logloss:0.12122
                                         validation 0-error:0.03001
validation_1-logloss:0.15620
                                 validation_1-error:0.04798
        validation_0-logloss:0.12085
[75]
                                         validation 0-error:0.03001
validation_1-logloss:0.15560
                                 validation_1-error:0.04798
        validation_0-logloss:0.12048
                                         validation_0-error:0.03001
[76]
validation_1-logloss:0.15529
                                 validation_1-error:0.04798
        validation_0-logloss:0.12023
                                         validation_0-error:0.03001
[77]
validation_1-logloss:0.15559
                                 validation_1-error:0.04798
[78]
        validation_0-logloss:0.11957
                                         validation_0-error:0.03001
validation_1-logloss:0.15604
                                 validation_1-error:0.04798
[79]
        validation_0-logloss:0.11921
                                         validation_0-error:0.03001
```

```
validation_1-logloss:0.15634
                                 validation_1-error:0.04648
[80]
        validation_0-logloss:0.11896
                                         validation_0-error:0.03001
validation_1-logloss:0.15636
                                 validation_1-error:0.04648
[81]
        validation_0-logloss:0.11867
                                         validation 0-error:0.03001
validation 1-logloss:0.15673
                                 validation 1-error:0.04648
[82]
        validation 0-logloss:0.11842
                                         validation 0-error:0.03001
validation 1-logloss:0.15680
                                 validation 1-error:0.04648
[83]
        validation_0-logloss:0.11708
                                         validation 0-error:0.03001
validation 1-logloss:0.15598
                                 validation 1-error:0.04798
                                         validation_0-error:0.02963
[84]
        validation_0-logloss:0.11649
validation_1-logloss:0.15519
                                 validation_1-error:0.04498
[85]
        validation_0-logloss:0.11628
                                         validation_0-error:0.02963
validation_1-logloss:0.15528
                                 validation_1-error:0.04498
        validation_0-logloss:0.11563
                                         validation_0-error:0.02963
[86]
validation_1-logloss:0.15504
                                 validation_1-error:0.04498
[87]
        validation_0-logloss:0.11508
                                         validation_0-error:0.02963
validation_1-logloss:0.15429
                                 validation_1-error:0.04498
[88]
        validation_0-logloss:0.11478
                                         validation_0-error:0.02963
validation_1-logloss:0.15418
                                 validation 1-error:0.04498
[89]
        validation 0-logloss:0.11403
                                         validation 0-error:0.02963
validation 1-logloss:0.15449
                                 validation 1-error:0.04498
        validation 0-logloss:0.11347
                                         validation 0-error:0.02963
[90]
validation_1-logloss:0.15364
                                 validation 1-error:0.04498
        validation_0-logloss:0.11316
                                         validation 0-error:0.02963
[91]
validation_1-logloss:0.15387
                                 validation_1-error:0.04498
[92]
        validation_0-logloss:0.11281
                                         validation_0-error:0.02963
validation_1-logloss:0.15399
                                 validation_1-error:0.04498
        validation_0-logloss:0.11235
[93]
                                         validation_0-error:0.02963
validation_1-logloss:0.15342
                                 validation 1-error:0.04498
[94]
        validation_0-logloss:0.11184
                                         validation_0-error:0.02963
validation_1-logloss:0.15322
                                 validation_1-error:0.04498
[95]
        validation_0-logloss:0.11142
                                         validation_0-error:0.02926
validation_1-logloss:0.15271
                                 validation_1-error:0.04498
[96]
        validation_0-logloss:0.11125
                                         validation_0-error:0.02888
validation 1-logloss:0.15275
                                 validation 1-error:0.04498
        validation 0-logloss:0.11093
[97]
                                         validation 0-error:0.02851
validation 1-logloss:0.15271
                                 validation_1-error:0.04498
[98]
        validation_0-logloss:0.11027
                                         validation 0-error:0.02851
validation_1-logloss:0.15324
                                 validation_1-error:0.04498
        validation_0-logloss:0.10976
                                         validation 0-error:0.02851
[99]
validation_1-logloss:0.15308
                                 validation_1-error:0.04498
        validation_0-logloss:0.10913
[100]
                                         validation_0-error:0.02888
validation_1-logloss:0.15309
                                 validation_1-error:0.04498
        validation_0-logloss:0.10899
                                         validation_0-error:0.02851
[101]
validation_1-logloss:0.15314
                                 validation_1-error:0.04498
[102]
        validation_0-logloss:0.10846
                                         validation_0-error:0.02851
validation_1-logloss:0.15333
                                 validation_1-error:0.04498
[103]
        validation_0-logloss:0.10825
                                         validation_0-error:0.02851
```

```
validation_1-logloss:0.15348
                                validation_1-error:0.04498
        validation_0-logloss:0.10788
                                         validation_0-error:0.02813
[104]
validation_1-logloss:0.15341
                                validation_1-error:0.04498
        validation 0-logloss:0.10734
                                         validation_0-error:0.02851
[105]
validation 1-logloss:0.15309
                                validation 1-error:0.04348
        validation 0-logloss:0.10708
                                         validation 0-error:0.02851
[106]
validation 1-logloss:0.15311
                                validation 1-error:0.04348
[107]
        validation_0-logloss:0.10650
                                         validation_0-error:0.02851
validation 1-logloss:0.15306
                                validation 1-error:0.04348
[108]
        validation_0-logloss:0.10613
                                         validation_0-error:0.02851
validation_1-logloss:0.15252
                                validation_1-error:0.04348
        validation_0-logloss:0.10578
                                         validation_0-error:0.02813
[109]
validation_1-logloss:0.15204
                                validation_1-error:0.04348
        validation_0-logloss:0.10562
                                        validation 0-error:0.02813
validation_1-logloss:0.15210
                                validation_1-error:0.04348
        validation_0-logloss:0.10550
                                         validation_0-error:0.02813
[111]
validation_1-logloss:0.15207
                                validation_1-error:0.04348
[112]
        validation_0-logloss:0.10524
                                         validation_0-error:0.02813
validation 1-logloss:0.15224
                                validation 1-error:0.04348
Γ1137
        validation 0-logloss:0.10508
                                         validation 0-error:0.02813
validation 1-logloss:0.15249
                                validation 1-error:0.04348
        validation 0-logloss:0.10483
[114]
                                         validation 0-error:0.02813
validation_1-logloss:0.15209
                                validation 1-error:0.04348
        validation 0-logloss:0.10451
                                         validation_0-error:0.02813
validation_1-logloss:0.15203
                                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)
[116]
        validation_0-logloss:0.10409
                                        validation_0-error:0.02813
validation 1-logloss:0.15270
                                validation 1-error:0.04498
        validation 0-logloss:0.10347
                                         validation 0-error:0.02813
[117]
validation 1-logloss:0.15286
                                validation 1-error:0.04498
                                         validation_0-error:0.02851
        validation 0-logloss:0.10292
validation_1-logloss:0.15238
                                validation 1-error:0.04498
        validation_0-logloss:0.10277
                                         validation_0-error:0.02851
[119]
validation_1-logloss:0.15271
                                validation 1-error:0.04498
        validation_0-logloss:0.62126
                                         validation_0-error:0.07014
validation_1-logloss:0.62301
                                validation_1-error:0.08696
        validation_0-logloss:0.56249
                                         validation_0-error:0.06864
[1]
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
        validation_0-logloss:0.40360
                                         validation_0-error:0.06602
[5]
validation_1-logloss:0.40962
                                 validation 1-error:0.08396
        validation 0-logloss:0.37547
                                         validation 0-error:0.05551
[6]
validation 1-logloss:0.38175
                                 validation 1-error:0.06897
        validation 0-logloss:0.35059
                                         validation 0-error:0.04914
validation_1-logloss:0.35796
                                 validation 1-error:0.06297
        validation_0-logloss:0.32898
                                         validation 0-error:0.04689
validation_1-logloss:0.33659
                                 validation_1-error:0.05847
        validation_0-logloss:0.30979
                                         validation_0-error:0.04464
[9]
validation_1-logloss:0.31881
                                 validation_1-error:0.05697
        validation_0-logloss:0.29335
[10]
                                         validation_0-error:0.04614
validation_1-logloss:0.30327
                                 validation 1-error:0.05847
        validation_0-logloss:0.27779
[11]
                                         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
                                         validation 0-error:0.04201
        validation_0-logloss:0.24026
validation 1-logloss:0.25123
                                 validation 1-error:0.05847
        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
        validation_0-logloss:0.21347
                                         validation_0-error:0.03976
[17]
validation_1-logloss:0.22695
                                 validation_1-error:0.05847
        validation_0-logloss:0.20629
                                         validation_0-error:0.03976
[18]
validation_1-logloss:0.22036
                                 validation_1-error:0.05847
[19]
        validation_0-logloss:0.19984
                                         validation_0-error:0.04013
                                 validation_1-error:0.05547
validation_1-logloss:0.21495
[20]
        validation_0-logloss:0.19433
                                         validation_0-error:0.03638
validation 1-logloss:0.20969
                                 validation 1-error:0.05697
        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
        validation_0-logloss:0.17949
                                         validation_0-error:0.03526
[23]
validation_1-logloss:0.19336
                                 validation 1-error:0.05247
        validation_0-logloss:0.17541
                                         validation_0-error:0.03563
[24]
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
        validation_0-logloss:0.16821
[26]
                                         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
        validation_0-logloss:0.15913
                                         validation_0-error:0.03263
[29]
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
        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-error:0.04947
validation_1-logloss:0.16956
        validation_0-logloss:0.15166
                                         validation_0-error:0.03188
[33]
validation_1-logloss:0.16870
                                 validation_1-error:0.04648
        validation_0-logloss:0.14961
                                         validation_0-error:0.03113
[34]
validation_1-logloss:0.16599
                                 validation 1-error:0.04498
        validation_0-logloss:0.14765
[35]
                                         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
        validation 0-logloss:0.14301
                                         validation 0-error:0.03001
validation 1-logloss:0.16051
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.14000
                                         validation_0-error:0.03038
[41]
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
        validation 0-logloss:0.13503
                                         validation 0-error:0.02851
validation 1-logloss:0.15537
                                 validation 1-error:0.04348
        validation 0-logloss:0.13406
                                         validation 0-error:0.02888
[46]
validation_1-logloss:0.15404
                                 validation 1-error:0.04348
        validation_0-logloss:0.13299
                                         validation_0-error:0.02851
[47]
validation_1-logloss:0.15399
                                 validation 1-error:0.04348
        validation_0-logloss:0.13171
                                         validation_0-error:0.02926
[48]
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
        validation_0-logloss:0.12976
[50]
                                         validation_0-error:0.02851
validation_1-logloss:0.15265
                                 validation_1-error:0.04048
[51]
        validation_0-logloss:0.12940
                                         validation_0-error:0.02888
validation_1-logloss:0.15282
                                 validation_1-error:0.04048
```

```
[52]
        validation_0-logloss:0.12880
                                         validation_0-error:0.02926
validation_1-logloss:0.15241
                                 validation_1-error:0.04048
        validation_0-logloss:0.12823
[53]
                                         validation_0-error:0.02926
validation_1-logloss:0.15268
                                 validation 1-error:0.04048
        validation 0-logloss:0.12751
                                         validation 0-error:0.02888
Γ54]
validation 1-logloss:0.15237
                                 validation 1-error:0.04198
        validation 0-logloss:0.12670
                                         validation 0-error:0.02813
validation_1-logloss:0.15255
                                 validation 1-error:0.04198
[56]
        validation_0-logloss:0.12632
                                         validation 0-error:0.02851
validation_1-logloss:0.15253
                                 validation_1-error:0.04348
        validation_0-logloss:0.12569
                                         validation_0-error:0.02813
[57]
validation_1-logloss:0.15250
                                 validation_1-error:0.04348
        validation_0-logloss:0.12469
[58]
                                         validation_0-error:0.02813
validation_1-logloss:0.15285
                                 validation 1-error:0.04198
        validation_0-logloss:0.12414
[59]
                                         validation_0-error:0.02851
validation_1-logloss:0.15293
                                 validation_1-error:0.04048
[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
validation 1-logloss:0.15292
                                 validation 1-error:0.04198
        validation 0-logloss:0.12260
                                         validation 0-error:0.02851
validation 1-logloss:0.15293
                                 validation 1-error:0.04198
        validation_0-logloss:0.12214
                                         validation_0-error:0.02813
validation_1-logloss:0.15304
                                 validation_1-error:0.04048
[64]
        validation_0-logloss:0.12157
                                         validation_0-error:0.02813
validation_1-logloss:0.15288
                                 validation_1-error:0.03898
        validation_0-logloss:0.12078
                                         validation_0-error:0.02851
[65]
validation_1-logloss:0.15169
                                 validation_1-error:0.03898
[66]
        validation_0-logloss:0.12029
                                         validation_0-error:0.02851
validation_1-logloss:0.15202
                                 validation_1-error:0.04048
[67]
        validation_0-logloss:0.12003
                                         validation_0-error:0.02851
                                 validation_1-error:0.03898
validation_1-logloss:0.15188
[68]
        validation_0-logloss:0.11946
                                         validation_0-error:0.02851
validation 1-logloss:0.15183
                                 validation 1-error:0.04198
        validation 0-logloss:0.11903
                                         validation 0-error:0.02813
validation 1-logloss:0.15159
                                 validation 1-error:0.04198
        validation 0-logloss:0.11876
                                         validation 0-error:0.02813
[70]
validation_1-logloss:0.15148
                                 validation 1-error:0.04198
        validation_0-logloss:0.11829
                                         validation_0-error:0.02813
[71]
validation_1-logloss:0.15154
                                 validation 1-error:0.04198
[72]
        validation_0-logloss:0.11767
                                         validation_0-error:0.02776
validation_1-logloss:0.15063
                                 validation_1-error:0.03748
[73]
        validation_0-logloss:0.11722
                                         validation_0-error:0.02813
validation_1-logloss:0.15075
                                 validation 1-error:0.03748
        validation_0-logloss:0.11698
[74]
                                         validation_0-error:0.02851
validation_1-logloss:0.15086
                                 validation_1-error:0.03748
[75]
        validation_0-logloss:0.11640
                                         validation_0-error:0.02776
validation_1-logloss:0.15089
                                 validation_1-error:0.03898
```

```
[76]
        validation_0-logloss:0.11593
                                         validation_0-error:0.02813
validation_1-logloss:0.15070
                                 validation_1-error:0.04048
        validation_0-logloss:0.11572
[77]
                                         validation_0-error:0.02813
validation_1-logloss:0.15089
                                 validation 1-error:0.04048
        validation 0-logloss:0.11494
                                         validation 0-error:0.02813
[78]
validation 1-logloss:0.15012
                                 validation 1-error:0.03748
        validation 0-logloss:0.11447
                                         validation 0-error:0.02813
validation_1-logloss:0.14952
                                 validation 1-error:0.03748
[80]
        validation_0-logloss:0.11416
                                         validation 0-error:0.02776
validation_1-logloss:0.14954
                                 validation_1-error:0.03748
        validation_0-logloss:0.11384
                                         validation_0-error:0.02776
[81]
validation_1-logloss:0.14984
                                 validation_1-error:0.03748
        validation_0-logloss:0.11322
[82]
                                         validation_0-error:0.02776
validation_1-logloss:0.14966
                                 validation 1-error:0.03748
        validation_0-logloss:0.11274
[83]
                                         validation_0-error:0.02738
validation_1-logloss:0.14929
                                 validation_1-error:0.03748
[84]
        validation_0-logloss:0.11244
                                         validation_0-error:0.02738
validation_1-logloss:0.14916
                                 validation_1-error:0.03748
[85]
        validation_0-logloss:0.11227
                                         validation_0-error:0.02738
validation 1-logloss:0.14936
                                 validation 1-error:0.03748
        validation 0-logloss:0.11163
                                         validation 0-error:0.02738
validation 1-logloss:0.14922
                                 validation 1-error:0.03748
        validation_0-logloss:0.11118
                                         validation_0-error:0.02738
validation 1-logloss:0.14920
                                 validation_1-error:0.03748
[88]
        validation_0-logloss:0.11086
                                         validation_0-error:0.02738
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
[90]
        validation_0-logloss:0.10992
                                         validation_0-error:0.02738
validation_1-logloss:0.14921
                                 validation_1-error:0.03748
[91]
        validation_0-logloss:0.10950
                                         validation_0-error:0.02738
validation_1-logloss:0.14937
                                 validation_1-error:0.03748
[92]
        validation_0-logloss:0.10932
                                         validation_0-error:0.02738
validation 1-logloss:0.14959
                                 validation 1-error:0.03748
        validation 0-logloss:0.10913
                                         validation 0-error:0.02738
validation 1-logloss:0.14972
                                 validation 1-error:0.03748
        validation 0-logloss:0.10863
                                         validation 0-error:0.02776
[94]
validation_1-logloss:0.14902
                                 validation 1-error:0.03748
        validation_0-logloss:0.10834
                                         validation_0-error:0.02738
[95]
validation_1-logloss:0.14886
                                 validation 1-error:0.03748
        validation_0-logloss:0.10791
                                         validation_0-error:0.02738
[96]
validation_1-logloss:0.14808
                                 validation_1-error:0.03748
[97]
        validation_0-logloss:0.10772
                                         validation_0-error:0.02738
validation_1-logloss:0.14847
                                 validation 1-error:0.03748
        validation_0-logloss:0.10734
[98]
                                         validation_0-error:0.02738
validation_1-logloss:0.14835
                                 validation_1-error:0.03748
[99]
        validation_0-logloss:0.10683
                                         validation_0-error:0.02738
validation_1-logloss:0.14806
                                 validation_1-error:0.03748
```

```
[100]
        validation_0-logloss:0.10643
                                         validation_0-error:0.02701
validation_1-logloss:0.14815
                                validation_1-error:0.03748
[101]
        validation_0-logloss:0.10627
                                         validation_0-error:0.02738
validation 1-logloss:0.14824
                                validation 1-error:0.03748
        validation 0-logloss:0.10580
                                         validation 0-error:0.02738
Γ1027
validation 1-logloss:0.14866
                                validation 1-error:0.03748
        validation 0-logloss:0.10536
                                         validation 0-error:0.02738
validation_1-logloss:0.14867
                                 validation 1-error:0.03898
        validation_0-logloss:0.10492
                                         validation 0-error:0.02738
[104]
validation_1-logloss:0.14862
                                validation_1-error:0.03898
        validation_0-logloss:0.10432
[105]
                                         validation_0-error:0.02701
validation_1-logloss:0.14843
                                validation_1-error:0.03898
        validation_0-logloss:0.10407
                                         validation_0-error:0.02701
[106]
validation 1-logloss:0.14840
                                validation_1-error:0.03748
[107]
        validation_0-logloss:0.10376
                                         validation_0-error:0.02626
validation_1-logloss:0.14852
                                validation_1-error:0.03898
[108]
        validation_0-logloss:0.10362
                                         validation_0-error:0.02626
validation_1-logloss:0.14864
                                validation_1-error:0.03898
[109]
        validation 0-logloss:0.10327
                                         validation_0-error:0.02626
validation 1-logloss:0.14856
                                validation 1-error:0.03898
        validation 0-logloss:0.10250
                                         validation 0-error:0.02551
validation 1-logloss:0.14814
                                validation 1-error:0.03748
[1111]
        validation_0-logloss:0.10221
                                         validation_0-error:0.02551
validation_1-logloss:0.14810
                                validation_1-error:0.03898
[112]
        validation_0-logloss:0.10204
                                         validation_0-error:0.02513
validation_1-logloss:0.14802
                                validation_1-error:0.03898
        validation_0-logloss:0.10168
                                         validation_0-error:0.02513
[113]
validation_1-logloss:0.14768
                                validation_1-error:0.03898
        validation_0-logloss:0.10155
[114]
                                         validation_0-error:0.02513
validation_1-logloss:0.14780
                                validation_1-error:0.03898
        validation_0-logloss:0.10125
                                         validation_0-error:0.02513
[115]
validation_1-logloss:0.14780
                                validation_1-error:0.03898
[116]
        validation_0-logloss:0.10086
                                         validation_0-error:0.02476
validation 1-logloss:0.14762
                                validation 1-error:0.03898
        validation 0-logloss:0.10058
                                         validation_0-error:0.02513
[117]
validation 1-logloss:0.14779
                                validation 1-error:0.03898
        validation 0-logloss:0.10031
                                         validation 0-error:0.02476
validation_1-logloss:0.14786
                                validation 1-error:0.03898
        validation_0-logloss:0.09992
                                         validation_0-error:0.02438
[119]
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)
```

validation_0-error:0.07127

validation_0-logloss:0.62077

[0]

```
validation_1-logloss:0.62326
                                 validation_1-error:0.09145
        validation_0-logloss:0.56152
                                         validation_0-error:0.07089
[1]
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
        validation 0-logloss:0.46992
                                         validation 0-error:0.07089
validation 1-logloss:0.47802
                                 validation 1-error:0.09145
        validation_0-logloss:0.43456
[4]
                                         validation 0-error:0.07089
validation 1-logloss:0.44444
                                 validation 1-error:0.09145
                                         validation_0-error:0.07089
        validation_0-logloss:0.40339
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
        validation_0-logloss:0.35303
                                         validation_0-error:0.05701
validation_1-logloss:0.36487
                                 validation_1-error:0.07046
        validation_0-logloss:0.33127
                                         validation_0-error:0.05664
validation_1-logloss:0.34306
                                 validation_1-error:0.07346
        validation_0-logloss:0.31199
                                         validation_0-error:0.05514
validation 1-logloss:0.32361
                                 validation 1-error:0.07046
Γ107
        validation 0-logloss:0.29366
                                         validation 0-error:0.05326
validation 1-logloss:0.30623
                                 validation 1-error:0.06897
        validation 0-logloss:0.27772
                                         validation 0-error:0.05364
[11]
validation_1-logloss:0.29066
                                 validation 1-error:0.06897
        validation_0-logloss:0.26394
                                         validation_0-error:0.05176
[12]
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
        validation_0-logloss:0.24123
                                         validation_0-error:0.04426
[14]
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
        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
        validation 0-logloss:0.20882
[18]
                                         validation 0-error:0.04088
validation 1-logloss:0.22700
                                 validation 1-error:0.05697
Г197
        validation_0-logloss:0.20291
                                         validation 0-error:0.04051
validation_1-logloss:0.22150
                                 validation_1-error:0.05697
        validation_0-logloss:0.19729
                                         validation 0-error:0.04163
[20]
validation_1-logloss:0.21643
                                 validation_1-error:0.05697
        validation_0-logloss:0.19236
[21]
                                         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
[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
                                         validation_0-error:0.03713
        validation_0-logloss:0.16333
[29]
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
        validation_0-logloss:0.15879
                                         validation_0-error:0.03601
[31]
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
Γ341
        validation 0-logloss:0.15329
                                         validation 0-error:0.03488
validation 1-logloss:0.17698
                                 validation 1-error:0.04798
        validation 0-logloss:0.15209
                                         validation 0-error:0.03488
[35]
validation_1-logloss:0.17661
                                 validation 1-error:0.04947
        validation_0-logloss:0.15026
                                         validation_0-error:0.03488
[36]
validation_1-logloss:0.17438
                                 validation_1-error:0.04798
        validation_0-logloss:0.14844
                                         validation_0-error:0.03488
[37]
validation_1-logloss:0.17338
                                 validation_1-error:0.04798
        validation_0-logloss:0.14745
                                         validation_0-error:0.03413
[38]
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
        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
        validation 0-logloss:0.14338
[42]
                                         validation 0-error:0.03338
                                 validation_1-error:0.04798
validation 1-logloss:0.17249
Γ431
        validation_0-logloss:0.14204
                                         validation 0-error:0.03338
validation_1-logloss:0.17121
                                 validation_1-error:0.04798
        validation_0-logloss:0.14062
                                         validation 0-error:0.03226
Γ441
validation_1-logloss:0.17064
                                 validation_1-error:0.04798
        validation_0-logloss:0.13999
[45]
                                         validation_0-error:0.03263
validation_1-logloss:0.17061
                                 validation_1-error:0.04798
        validation_0-logloss:0.13900
                                         validation_0-error:0.03226
[46]
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
[50]
        validation_0-logloss:0.13578
                                         validation_0-error:0.03113
validation 1-logloss:0.16977
                                 validation 1-error:0.04648
[51]
        validation 0-logloss:0.13511
                                         validation 0-error:0.03113
validation 1-logloss:0.16946
                                 validation 1-error:0.04498
[52]
        validation_0-logloss:0.13395
                                         validation 0-error:0.03113
validation 1-logloss:0.16801
                                 validation 1-error:0.04498
                                         validation_0-error:0.03113
        validation_0-logloss:0.13264
[53]
validation_1-logloss:0.16756
                                 validation_1-error:0.04498
[54]
        validation_0-logloss:0.13213
                                         validation_0-error:0.03076
validation_1-logloss:0.16739
                                 validation_1-error:0.04498
        validation_0-logloss:0.13133
                                         validation_0-error:0.03076
[55]
validation_1-logloss:0.16786
                                 validation_1-error:0.04498
[56]
        validation_0-logloss:0.13032
                                         validation_0-error:0.03076
validation_1-logloss:0.16766
                                 validation_1-error:0.04498
[57]
        validation_0-logloss:0.12966
                                         validation_0-error:0.03076
validation_1-logloss:0.16700
                                 validation 1-error:0.04498
Γ581
        validation 0-logloss:0.12851
                                         validation 0-error:0.03038
validation 1-logloss:0.16731
                                 validation 1-error:0.04648
        validation 0-logloss:0.12808
                                         validation 0-error:0.03076
[59]
validation_1-logloss:0.16758
                                 validation 1-error:0.04648
        validation_0-logloss:0.12740
                                         validation_0-error:0.03038
[60]
validation_1-logloss:0.16668
                                 validation_1-error:0.04798
        validation_0-logloss:0.12689
                                         validation_0-error:0.03038
[61]
validation_1-logloss:0.16671
                                 validation_1-error:0.04798
        validation_0-logloss:0.12586
                                         validation_0-error:0.03038
[62]
validation_1-logloss:0.16611
                                 validation 1-error:0.04798
[63]
        validation_0-logloss:0.12544
                                         validation_0-error:0.03001
validation_1-logloss:0.16656
                                 validation_1-error:0.04798
        validation_0-logloss:0.12502
                                         validation_0-error:0.03001
validation_1-logloss:0.16654
                                 validation_1-error:0.04798
[65]
        validation_0-logloss:0.12431
                                         validation_0-error:0.03001
validation 1-logloss:0.16622
                                 validation 1-error:0.04798
        validation 0-logloss:0.12375
[66]
                                         validation 0-error:0.03001
                                 validation_1-error:0.04798
validation 1-logloss:0.16614
[67]
        validation_0-logloss:0.12289
                                         validation 0-error:0.03001
validation_1-logloss:0.16614
                                 validation_1-error:0.04648
        validation_0-logloss:0.12246
                                         validation 0-error:0.03001
[68]
validation_1-logloss:0.16593
                                 validation_1-error:0.04648
        validation_0-logloss:0.12178
[69]
                                         validation_0-error:0.03001
validation_1-logloss:0.16574
                                 validation_1-error:0.04648
[70]
        validation_0-logloss:0.12109
                                         validation_0-error:0.02926
validation_1-logloss:0.16563
                                 validation_1-error:0.04648
[71]
        validation_0-logloss:0.12073
                                         validation_0-error:0.02963
validation_1-logloss:0.16564
                                 validation_1-error:0.04648
[72]
        validation_0-logloss:0.12026
                                         validation_0-error:0.02963
```

```
validation_1-logloss:0.16605
                                 validation_1-error:0.04648
[73]
        validation_0-logloss:0.11978
                                         validation_0-error:0.03001
validation_1-logloss:0.16588
                                 validation_1-error:0.04648
[74]
        validation_0-logloss:0.11942
                                         validation_0-error:0.03001
validation 1-logloss:0.16601
                                 validation 1-error:0.04648
[75]
        validation 0-logloss:0.11896
                                         validation 0-error:0.03001
validation 1-logloss:0.16597
                                 validation 1-error:0.04648
        validation_0-logloss:0.11812
[76]
                                         validation 0-error:0.02963
validation 1-logloss:0.16545
                                 validation 1-error:0.04648
                                         validation_0-error:0.02926
        validation_0-logloss:0.11774
[77]
validation_1-logloss:0.16550
                                 validation_1-error:0.04648
[78]
        validation_0-logloss:0.11729
                                         validation_0-error:0.02888
validation_1-logloss:0.16509
                                 validation_1-error:0.04798
        validation_0-logloss:0.11713
                                         validation_0-error:0.02888
[79]
validation_1-logloss:0.16505
                                 validation_1-error:0.04648
[80]
        validation_0-logloss:0.11656
                                         validation_0-error:0.02888
validation_1-logloss:0.16578
                                 validation_1-error:0.04648
[81]
        validation_0-logloss:0.11611
                                         validation_0-error:0.02851
validation_1-logloss:0.16557
                                 validation 1-error:0.04648
[82]
        validation 0-logloss:0.11546
                                         validation 0-error:0.02851
validation 1-logloss:0.16580
                                 validation 1-error:0.04648
        validation 0-logloss:0.11534
                                         validation 0-error:0.02888
[83]
validation_1-logloss:0.16557
                                 validation 1-error:0.04648
        validation 0-logloss:0.11491
                                         validation_0-error:0.02888
[84]
validation_1-logloss:0.16540
                                 validation_1-error:0.04498
        validation_0-logloss:0.11462
                                         validation_0-error:0.02888
[85]
validation_1-logloss:0.16548
                                 validation_1-error:0.04498
        validation_0-logloss:0.11426
                                         validation_0-error:0.02851
[86]
validation_1-logloss:0.16549
                                 validation 1-error:0.04648
[87]
        validation_0-logloss:0.11393
                                         validation_0-error:0.02813
validation_1-logloss:0.16531
                                 validation_1-error:0.04648
[88]
        validation_0-logloss:0.11343
                                         validation_0-error:0.02813
validation_1-logloss:0.16542
                                 validation_1-error:0.04648
                                         validation_0-error:0.02813
[89]
        validation_0-logloss:0.11305
validation 1-logloss:0.16596
                                 validation 1-error:0.04498
        validation 0-logloss:0.11258
[90]
                                         validation 0-error:0.02851
validation 1-logloss:0.16607
                                 validation 1-error:0.04498
[91]
        validation_0-logloss:0.11236
                                         validation 0-error:0.02888
validation_1-logloss:0.16643
                                 validation_1-error:0.04498
        validation_0-logloss:0.11191
                                         validation 0-error:0.02851
[92]
validation_1-logloss:0.16642
                                 validation_1-error:0.04498
        validation_0-logloss:0.11133
[93]
                                         validation_0-error:0.02851
validation_1-logloss:0.16625
                                 validation_1-error:0.04498
[94]
        validation_0-logloss:0.11102
                                         validation_0-error:0.02851
validation_1-logloss:0.16628
                                 validation_1-error:0.04648
[95]
        validation_0-logloss:0.11084
                                         validation_0-error:0.02888
validation_1-logloss:0.16652
                                 validation_1-error:0.04648
[96]
        validation_0-logloss:0.11058
                                         validation_0-error:0.02888
```

```
validation_1-logloss:0.16675
                                 validation_1-error:0.04648
[97]
        validation_0-logloss:0.11003
                                         validation_0-error:0.02888
validation_1-logloss:0.16632
                                 validation_1-error:0.04498
[98]
        validation 0-logloss:0.10968
                                         validation_0-error:0.02851
validation 1-logloss:0.16654
                                 validation 1-error:0.04498
[99]
        validation 0-logloss:0.10928
                                         validation 0-error:0.02851
validation 1-logloss:0.16695
                                 validation 1-error:0.04498
[100]
        validation_0-logloss:0.10866
                                         validation 0-error:0.02776
validation 1-logloss:0.16691
                                 validation 1-error:0.04498
[101]
        validation_0-logloss:0.10793
                                         validation_0-error:0.02813
validation_1-logloss:0.16705
                                 validation_1-error:0.04498
[102]
        validation_0-logloss:0.10744
                                         validation_0-error:0.02851
validation_1-logloss:0.16668
                                 validation_1-error:0.04498
        validation_0-logloss:0.10721
                                         validation 0-error:0.02776
[103]
validation_1-logloss:0.16745
                                 validation_1-error:0.04498
[104]
        validation_0-logloss:0.10668
                                         validation_0-error:0.02776
validation_1-logloss:0.16760
                                 validation_1-error:0.04498
[105]
        validation_0-logloss:0.10607
                                         validation_0-error:0.02738
validation 1-logloss:0.16714
                                 validation 1-error:0.04498
[106]
        validation 0-logloss:0.10583
                                         validation 0-error:0.02851
validation 1-logloss:0.16725
                                 validation 1-error:0.04498
        validation 0-logloss:0.10545
                                         validation_0-error:0.02851
[107]
validation_1-logloss:0.16754
                                 validation 1-error:0.04498
        validation_0-logloss:0.10525
                                         validation 0-error:0.02813
[108]
validation_1-logloss:0.16781
                                 validation_1-error:0.04498
        validation_0-logloss:0.10463
                                         validation_0-error:0.02776
[109]
validation_1-logloss:0.16747
                                 validation_1-error:0.04498
        validation_0-logloss:0.10435
[110]
                                         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
        validation 0-logloss:0.10267
[114]
                                         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
        validation_0-logloss:0.10155
[116]
                                         validation 0-error:0.02588
validation_1-logloss:0.16641
                                 validation_1-error:0.04498
        validation_0-logloss:0.10128
                                         validation_0-error:0.02588
[117]
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

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
Γ1187
        validation 0-logloss:0.10103
                                         validation_0-error:0.02551
validation_1-logloss:0.16635
                                 validation 1-error:0.04498
        validation_0-logloss:0.10058
                                         validation_0-error:0.02551
[119]
validation_1-logloss:0.16655
                                 validation_1-error:0.04498
        validation_0-logloss:0.62173
                                         validation 0-error:0.07277
[0]
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
        validation_0-logloss:0.51379
                                         validation_0-error:0.06977
validation_1-logloss:0.51841
                                 validation_1-error:0.08846
        validation_0-logloss:0.47240
[3]
                                         validation_0-error:0.05664
validation_1-logloss:0.47782
                                 validation_1-error:0.06597
        validation_0-logloss:0.43691
[4]
                                         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
        validation_0-logloss:0.37956
                                         validation_0-error:0.05626
validation_1-logloss:0.38714
                                 validation 1-error:0.06597
        validation_0-logloss:0.35396
                                         validation_0-error:0.05514
[7]
validation 1-logloss:0.36200
                                 validation 1-error:0.06597
        validation_0-logloss:0.33175
                                         validation_0-error:0.05514
[8]
validation 1-logloss:0.33980
                                 validation 1-error:0.06747
        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
        validation_0-logloss:0.27966
                                         validation_0-error:0.04689
[11]
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
        validation_0-logloss:0.25365
                                         validation_0-error:0.04276
validation_1-logloss:0.26489
                                 validation 1-error:0.05547
Γ14]
        validation_0-logloss:0.24251
                                         validation_0-error:0.04314
validation_1-logloss:0.25425
                                 validation_1-error:0.05697
        validation_0-logloss:0.23283
                                         validation 0-error:0.04276
[15]
validation_1-logloss:0.24511
                                 validation_1-error:0.05697
        validation 0-logloss:0.22423
                                         validation 0-error:0.04201
[16]
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
        validation_0-logloss:0.20889
[18]
                                         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
```

your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].

validation_1-error:0.05397

validation_0-error:0.03901

validation_1-logloss:0.21695

[20]

validation_0-logloss:0.19706

```
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
Γ241
        validation_0-logloss:0.17813
                                         validation 0-error:0.03638
validation 1-logloss:0.19398
                                 validation 1-error:0.05397
                                         validation_0-error:0.03638
        validation_0-logloss:0.17376
[25]
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
        validation_0-logloss:0.16745
                                         validation_0-error:0.03638
[27]
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
        validation 0-logloss:0.15748
                                         validation 0-error:0.03563
[31]
validation_1-logloss:0.17478
                                 validation 1-error:0.04947
        validation_0-logloss:0.15602
                                         validation_0-error:0.03563
[32]
validation_1-logloss:0.17366
                                 validation_1-error:0.04947
        validation_0-logloss:0.15457
                                         validation_0-error:0.03638
[33]
validation_1-logloss:0.17233
                                 validation_1-error:0.04947
        validation_0-logloss:0.15319
                                         validation_0-error:0.03601
[34]
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
        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
        validation 0-logloss:0.14718
[38]
                                         validation 0-error:0.03376
                                 validation_1-error:0.04947
validation 1-logloss:0.16758
[39]
        validation_0-logloss:0.14562
                                         validation 0-error:0.03376
validation_1-logloss:0.16684
                                 validation_1-error:0.04947
        validation_0-logloss:0.14450
                                         validation 0-error:0.03376
Γ401
validation_1-logloss:0.16561
                                 validation_1-error:0.04648
        validation_0-logloss:0.14359
[41]
                                         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
                                         validation_0-error:0.03301
        validation_0-logloss:0.13557
[49]
validation_1-logloss:0.16265
                                 validation_1-error:0.04648
[50]
        validation_0-logloss:0.13529
                                         validation_0-error:0.03301
validation_1-logloss:0.16291
                                 validation_1-error:0.04648
        validation_0-logloss:0.13422
                                         validation_0-error:0.03226
[51]
validation_1-logloss:0.16253
                                 validation_1-error:0.04648
[52]
        validation_0-logloss:0.13301
                                         validation_0-error:0.03263
validation_1-logloss:0.16242
                                 validation_1-error:0.04648
[53]
        validation_0-logloss:0.13198
                                         validation_0-error:0.03226
validation_1-logloss:0.16247
                                 validation 1-error:0.04648
Γ54]
        validation 0-logloss:0.13155
                                         validation 0-error:0.03226
validation 1-logloss:0.16256
                                 validation 1-error:0.04648
        validation 0-logloss:0.13133
                                         validation 0-error:0.03226
[55]
validation_1-logloss:0.16236
                                 validation 1-error:0.04648
        validation_0-logloss:0.13062
                                         validation_0-error:0.03226
[56]
validation_1-logloss:0.16165
                                 validation_1-error:0.04648
        validation_0-logloss:0.12970
                                         validation_0-error:0.03226
[57]
validation_1-logloss:0.16181
                                 validation_1-error:0.04648
        validation_0-logloss:0.12913
                                         validation_0-error:0.03263
[58]
validation_1-logloss:0.16138
                                 validation 1-error:0.04648
[59]
        validation_0-logloss:0.12834
                                         validation_0-error:0.03226
validation_1-logloss:0.16090
                                 validation_1-error:0.04648
        validation_0-logloss:0.12789
[60]
                                         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
validation 1-logloss:0.16087
                                 validation 1-error:0.04648
        validation 0-logloss:0.12678
[62]
                                         validation 0-error:0.03113
validation 1-logloss:0.16136
                                 validation 1-error:0.04648
[63]
        validation_0-logloss:0.12646
                                         validation 0-error:0.03076
validation_1-logloss:0.16152
                                 validation_1-error:0.04648
        validation_0-logloss:0.12616
                                         validation 0-error:0.03076
[64]
validation_1-logloss:0.16160
                                 validation_1-error:0.04648
        validation_0-logloss:0.12580
                                         validation_0-error:0.03113
[65]
validation_1-logloss:0.16155
                                 validation_1-error:0.04648
[66]
        validation_0-logloss:0.12525
                                         validation_0-error:0.03113
validation_1-logloss:0.16162
                                 validation_1-error:0.04648
[67]
        validation_0-logloss:0.12489
                                         validation_0-error:0.03113
validation_1-logloss:0.16140
                                 validation_1-error:0.04648
[68]
        validation_0-logloss:0.12448
                                         validation_0-error:0.03113
```

```
validation_1-logloss:0.16145
                                 validation_1-error:0.04498
[69]
        validation_0-logloss:0.12414
                                         validation_0-error:0.03113
validation_1-logloss:0.16156
                                 validation_1-error:0.04498
[70]
        validation_0-logloss:0.12376
                                         validation_0-error:0.03038
validation 1-logloss:0.16165
                                 validation 1-error:0.04498
[71]
        validation 0-logloss:0.12343
                                         validation 0-error:0.03038
validation 1-logloss:0.16182
                                 validation 1-error:0.04498
        validation_0-logloss:0.12237
[72]
                                         validation 0-error:0.03038
validation 1-logloss:0.16213
                                 validation 1-error:0.04498
                                         validation_0-error:0.03001
        validation_0-logloss:0.12186
[73]
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
        validation_0-logloss:0.12125
                                         validation_0-error:0.03001
[75]
validation_1-logloss:0.16278
                                 validation_1-error:0.04498
[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
        validation 0-logloss:0.11961
                                         validation 0-error:0.03038
[79]
validation_1-logloss:0.16282
                                 validation 1-error:0.04498
        validation_0-logloss:0.11940
                                         validation_0-error:0.03001
[80]
validation_1-logloss:0.16272
                                 validation_1-error:0.04648
        validation_0-logloss:0.11911
                                         validation_0-error:0.03001
[81]
validation_1-logloss:0.16278
                                 validation_1-error:0.04648
        validation_0-logloss:0.11878
                                         validation_0-error:0.02926
[82]
validation_1-logloss:0.16300
                                 validation 1-error:0.04648
[83]
        validation_0-logloss:0.11832
                                         validation_0-error:0.02926
validation_1-logloss:0.16311
                                 validation_1-error:0.04648
        validation_0-logloss:0.11805
                                         validation_0-error:0.02926
validation_1-logloss:0.16321
                                 validation_1-error:0.04648
[85]
        validation_0-logloss:0.11718
                                         validation_0-error:0.03001
validation 1-logloss:0.16360
                                 validation 1-error:0.04498
        validation 0-logloss:0.11701
[86]
                                         validation 0-error:0.02963
                                 validation_1-error:0.04498
validation 1-logloss:0.16361
[87]
        validation_0-logloss:0.11670
                                         validation 0-error:0.02963
validation_1-logloss:0.16343
                                 validation_1-error:0.04498
        validation_0-logloss:0.11615
                                         validation 0-error:0.02963
[88]
validation_1-logloss:0.16367
                                 validation_1-error:0.04498
        validation_0-logloss:0.11569
[89]
                                         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
        validation 0-logloss:0.11354
                                         validation 0-error:0.03001
[95]
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)
        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
        validation_0-logloss:0.11103
                                         validation_0-error:0.02926
[102]
validation_1-logloss:0.16335
                                validation_1-error:0.04498
        validation_0-logloss:0.11068
                                         validation 0-error:0.02926
[103]
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
        validation 0-logloss:0.10960
                                         validation 0-error:0.02888
[106]
validation 1-logloss:0.16293
                                validation 1-error:0.04498
                                         validation_0-error:0.02851
        validation 0-logloss:0.10919
validation_1-logloss:0.16277
                                validation 1-error:0.04498
        validation_0-logloss:0.10894
                                         validation_0-error:0.02813
[108]
validation_1-logloss:0.16267
                                validation 1-error:0.04648
        validation_0-logloss:0.10875
                                         validation_0-error:0.02813
[109]
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
[111]
        validation_0-logloss:0.10826
                                         validation_0-error:0.02851
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
        validation_0-logloss:0.10754
                                         validation_0-error:0.02851
[114]
validation_1-logloss:0.16401
                                 validation 1-error:0.04648
        validation 0-logloss:0.10723
                                         validation 0-error:0.02851
[115]
validation 1-logloss:0.16399
                                 validation 1-error:0.04648
        validation 0-logloss:0.10688
                                         validation 0-error:0.02851
validation_1-logloss:0.16405
                                 validation 1-error:0.04648
        validation_0-logloss:0.10650
                                         validation 0-error:0.02851
[117]
validation_1-logloss:0.16399
                                 validation_1-error:0.04648
        validation_0-logloss:0.10627
                                         validation_0-error:0.02851
[118]
validation_1-logloss:0.16409
                                 validation_1-error:0.04648
        validation_0-logloss:0.10587
                                         validation_0-error:0.02851
[119]
validation_1-logloss:0.16356
                                 validation 1-error:0.04648
        validation_0-logloss:0.61605
[0]
                                         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
        validation 0-logloss:0.45547
                                         validation 0-error:0.04726
validation 1-logloss:0.46285
                                 validation 1-error:0.06147
        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
        validation_0-logloss:0.35590
                                         validation_0-error:0.04726
[6]
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
        validation_0-logloss:0.30817
                                         validation_0-error:0.04726
[8]
                                 validation_1-error:0.06297
validation_1-logloss:0.31959
        validation_0-logloss:0.28743
[9]
                                         validation_0-error:0.04689
validation 1-logloss:0.29934
                                 validation 1-error:0.06297
        validation 0-logloss:0.26928
                                         validation 0-error:0.04539
validation 1-logloss:0.28167
                                 validation 1-error:0.05997
        validation 0-logloss:0.25376
                                         validation 0-error:0.04163
[11]
validation_1-logloss:0.26623
                                 validation 1-error:0.05247
        validation_0-logloss:0.23946
                                         validation_0-error:0.04163
[12]
validation_1-logloss:0.25274
                                 validation 1-error:0.05097
        validation_0-logloss:0.22691
                                         validation_0-error:0.04239
[13]
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
        validation_0-logloss:0.20645
[15]
                                         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
        validation_0-logloss:0.18306
                                         validation_0-error:0.03488
[18]
validation_1-logloss:0.19873
                                 validation 1-error:0.04348
        validation 0-logloss:0.17640
                                         validation 0-error:0.03151
Г197
validation 1-logloss:0.19296
                                 validation 1-error:0.04198
        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-error:0.04048
validation_1-logloss:0.18293
[22]
        validation_0-logloss:0.16141
                                         validation_0-error:0.03076
validation_1-logloss:0.17966
                                 validation_1-error:0.03898
        validation_0-logloss:0.15784
                                         validation_0-error:0.03038
[23]
validation_1-logloss:0.17574
                                 validation 1-error:0.03898
        validation_0-logloss:0.15410
[24]
                                         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
                                         validation_0-error:0.03001
[26]
        validation 0-logloss:0.14731
validation 1-logloss:0.16930
                                 validation 1-error:0.03898
        validation 0-logloss:0.14433
                                         validation 0-error:0.02963
validation 1-logloss:0.16648
                                 validation 1-error:0.03898
        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-error:0.03898
validation_1-logloss:0.15701
[33]
        validation_0-logloss:0.12927
                                         validation_0-error:0.02851
validation 1-logloss:0.15500
                                 validation 1-error:0.03898
        validation 0-logloss:0.12641
                                         validation 0-error:0.02738
[34]
validation 1-logloss:0.15441
                                 validation 1-error:0.03898
        validation 0-logloss:0.12454
                                         validation 0-error:0.02813
[35]
validation_1-logloss:0.15273
                                 validation 1-error:0.03898
        validation_0-logloss:0.12209
                                         validation_0-error:0.02813
[36]
validation_1-logloss:0.15238
                                 validation 1-error:0.03898
        validation_0-logloss:0.12085
                                         validation_0-error:0.02813
[37]
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
        validation_0-logloss:0.11806
[39]
                                         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
        validation_0-logloss:0.11402
                                         validation_0-error:0.02701
[42]
validation_1-logloss:0.14724
                                 validation 1-error:0.03598
        validation 0-logloss:0.11282
                                         validation 0-error:0.02701
Γ431
validation 1-logloss:0.14725
                                 validation 1-error:0.03448
        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
        validation_0-logloss:0.10943
                                         validation_0-error:0.02663
[46]
validation_1-logloss:0.14610
                                 validation_1-error:0.03748
        validation_0-logloss:0.10877
                                         validation_0-error:0.02663
[47]
validation_1-logloss:0.14608
                                 validation 1-error:0.03748
        validation_0-logloss:0.10775
[48]
                                         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
        validation_0-logloss:0.55172
                                         validation 0-error:0.04539
validation 1-logloss:0.55447
                                 validation 1-error:0.05697
        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
        validation_0-logloss:0.41537
                                         validation_0-error:0.04539
[4]
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
        validation_0-logloss:0.35419
                                         validation_0-error:0.04501
[6]
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
        validation 0-logloss:0.30632
                                         validation 0-error:0.04389
validation 1-logloss:0.31420
                                 validation 1-error:0.05247
        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
        validation_0-logloss:0.25348
                                         validation_0-error:0.04314
[11]
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
        validation_0-logloss:0.22768
[13]
                                         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
```

```
validation_0-logloss:0.20732
                                        validation_0-error:0.03826
validation_1-logloss:0.21707
                                validation_1-error:0.04348
        validation_0-logloss:0.19832
                                        validation_0-error:0.03751
[16]
validation 1-logloss:0.20945
                                validation 1-error:0.04198
        validation 0-logloss:0.19010
                                         validation 0-error:0.03713
[17]
validation 1-logloss:0.20280
                                validation 1-error:0.04198
        validation 0-logloss:0.18282
                                         validation 0-error:0.03788
validation_1-logloss:0.19690
                                validation 1-error:0.04198
        validation_0-logloss:0.17621
                                         validation 0-error:0.03713
[19]
validation_1-logloss:0.19145
                                validation_1-error:0.04198
        validation_0-logloss:0.17032
[20]
                                         validation_0-error:0.03676
validation_1-logloss:0.18670
                                validation_1-error:0.04348
        validation_0-logloss:0.16521
                                         validation_0-error:0.03713
[21]
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
        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
        validation_0-logloss:0.14180
                                         validation_0-error:0.03263
[28]
validation_1-logloss:0.16062
                                validation_1-error:0.03898
        validation_0-logloss:0.13945
[29]
                                         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
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:0.13512
                                        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
```

[15]

```
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-error:0.03748
validation 1-logloss:0.15202
[36]
        validation_0-logloss:0.12696
                                         validation_0-error:0.03038
validation 1-logloss:0.15171
                                 validation 1-error:0.03748
                                         validation_0-error:0.03038
[37]
        validation_0-logloss:0.12542
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
        validation_0-logloss:0.12346
                                         validation_0-error:0.03038
[39]
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
        validation 0-logloss:0.11957
                                         validation 0-error:0.02963
[43]
validation_1-logloss:0.14834
                                 validation_1-error:0.03598
        validation_0-logloss:0.11822
                                         validation_0-error:0.02963
[44]
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
        validation_0-logloss:0.11565
[46]
                                         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
        validation_0-logloss:0.11309
[48]
                                         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
        validation 0-logloss:0.61606
[0]
                                         validation 0-error:0.05439
validation 1-logloss:0.61678
                                 validation 1-error:0.05697
        validation_0-logloss:0.55295
                                         validation 0-error:0.05326
validation_1-logloss:0.55393
                                 validation_1-error:0.05247
        validation_0-logloss:0.50032
                                         validation_0-error:0.05326
[2]
validation_1-logloss:0.50182
                                 validation_1-error:0.05097
        validation_0-logloss:0.45516
                                         validation_0-error:0.05064
[3]
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
        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
        validation_0-logloss:0.32671
                                         validation_0-error:0.04051
[7]
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
        validation 0-logloss:0.28422
                                         validation 0-error:0.03751
validation 1-logloss:0.29215
                                 validation 1-error:0.05097
Γ107
        validation_0-logloss:0.26682
                                         validation_0-error:0.03526
validation 1-logloss:0.27571
                                 validation 1-error:0.04798
                                         validation_0-error:0.03488
[11]
        validation_0-logloss:0.25151
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
        validation_0-logloss:0.22547
                                         validation_0-error:0.03413
[13]
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
Г16Т
        validation 0-logloss:0.19640
                                         validation 0-error:0.03113
validation 1-logloss:0.21244
                                 validation 1-error:0.04498
        validation 0-logloss:0.18903
                                         validation 0-error:0.03113
[17]
validation_1-logloss:0.20558
                                 validation_1-error:0.04498
        validation_0-logloss:0.18243
                                         validation_0-error:0.03113
[18]
validation_1-logloss:0.19914
                                 validation_1-error:0.04498
        validation_0-logloss:0.17634
                                         validation_0-error:0.03038
[19]
validation_1-logloss:0.19455
                                 validation_1-error:0.04498
        validation_0-logloss:0.17098
[20]
                                         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
        validation_0-logloss:0.16126
[22]
                                         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
        validation 0-logloss:0.15361
Γ241
                                         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
        validation_0-logloss:0.14739
[26]
                                         validation 0-error:0.02813
validation_1-logloss:0.17048
                                 validation_1-error:0.04348
        validation_0-logloss:0.14439
[27]
                                         validation_0-error:0.02813
validation_1-logloss:0.16822
                                 validation_1-error:0.04348
        validation_0-logloss:0.14189
                                         validation_0-error:0.02851
[28]
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
        validation_0-logloss:0.12746
[34]
                                         validation_0-error:0.02626
validation 1-logloss:0.15680
                                 validation 1-error:0.04198
                                         validation_0-error:0.02663
        validation_0-logloss:0.12490
[35]
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
        validation_0-logloss:0.12196
                                         validation_0-error:0.02663
[37]
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
Γ401
        validation 0-logloss:0.11850
                                         validation 0-error:0.02626
validation 1-logloss:0.15314
                                 validation 1-error:0.03748
        validation 0-logloss:0.11719
                                         validation 0-error:0.02701
[41]
validation_1-logloss:0.15309
                                 validation 1-error:0.03748
        validation_0-logloss:0.11626
                                         validation_0-error:0.02663
[42]
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
        validation_0-logloss:0.11429
                                         validation_0-error:0.02738
[44]
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
        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
        validation 0-logloss:0.10999
[48]
                                         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
        validation_0-logloss:0.61545
                                         validation 0-error:0.04989
[0]
validation_1-logloss:0.61817
                                 validation_1-error:0.07046
        validation_0-logloss:0.55171
                                         validation_0-error:0.04876
[1]
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
        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
        validation_0-logloss:0.38197
                                         validation_0-error:0.04726
[5]
validation_1-logloss:0.39193
                                 validation_1-error:0.07046
        validation_0-logloss:0.35303
                                         validation_0-error:0.04689
[6]
validation 1-logloss:0.36511
                                 validation 1-error:0.07046
        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
                                         validation_0-error:0.04239
        validation_0-logloss:0.28742
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
        validation_0-logloss:0.25427
                                         validation_0-error:0.04501
[11]
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
Γ147
        validation 0-logloss:0.21746
                                         validation 0-error:0.04013
validation 1-logloss:0.23526
                                 validation 1-error:0.05547
        validation 0-logloss:0.20794
                                         validation 0-error:0.03976
[15]
validation_1-logloss:0.22565
                                 validation_1-error:0.05397
        validation_0-logloss:0.19957
                                         validation_0-error:0.03788
[16]
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
        validation_0-logloss:0.18446
[18]
                                         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
        validation 0-logloss:0.16313
[22]
                                         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
        validation_0-logloss:0.15471
                                         validation 0-error:0.03601
Γ241
validation_1-logloss:0.18294
                                 validation_1-error:0.04798
        validation_0-logloss:0.15054
                                         validation_0-error:0.03526
[25]
validation_1-logloss:0.18051
                                 validation_1-error:0.04798
        validation_0-logloss:0.14689
                                         validation_0-error:0.03488
[26]
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
        validation_0-logloss:0.13900
                                        validation_0-error:0.03301
[29]
validation_1-logloss:0.17290
                                validation_1-error:0.04498
        validation 0-logloss:0.13725
                                        validation 0-error:0.03226
[30]
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)
Г317
        validation_0-logloss:0.13425
                                        validation_0-error:0.03151
validation 1-logloss:0.16994
                                validation 1-error:0.04348
        validation 0-logloss:0.13271
                                        validation 0-error:0.03151
validation 1-logloss:0.16792
                                validation 1-error:0.04198
        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
        validation_0-logloss:0.12625
                                        validation_0-error:0.03151
[35]
validation_1-logloss:0.16437
                                validation_1-error:0.04198
                                        validation_0-error:0.03151
        validation 0-logloss:0.12462
[36]
validation_1-logloss:0.16459
                                validation_1-error:0.04198
        validation_0-logloss:0.12311
                                        validation_0-error:0.03113
[37]
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
        validation 0-logloss:0.12035
                                        validation 0-error:0.03151
validation 1-logloss:0.16350
                                validation 1-error:0.04048
                                        validation_0-error:0.03151
        validation 0-logloss:0.11922
[40]
validation_1-logloss:0.16378
                                validation 1-error:0.04048
        validation_0-logloss:0.11848
                                        validation_0-error:0.03113
[41]
validation_1-logloss:0.16242
                                validation 1-error:0.04048
        validation_0-logloss:0.11751
                                        validation_0-error:0.03076
[42]
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
        validation_0-logloss:0.11081
                                         validation_0-error:0.02963
[47]
validation_1-logloss:0.16091
                                 validation 1-error:0.04348
        validation 0-logloss:0.10983
                                         validation 0-error:0.02926
Γ48]
validation 1-logloss:0.16088
                                 validation 1-error:0.04348
        validation 0-logloss:0.10895
                                         validation 0-error:0.02926
validation_1-logloss:0.16081
                                 validation 1-error:0.04348
        validation_0-logloss:0.61582
                                         validation 0-error:0.05064
                                 validation_1-error:0.06747
validation_1-logloss:0.61818
        validation_0-logloss:0.55229
                                         validation_0-error:0.04726
[1]
validation_1-logloss:0.55660
                                 validation_1-error:0.06597
        validation_0-logloss:0.49964
                                         validation_0-error:0.04689
validation_1-logloss:0.50529
                                 validation 1-error:0.06297
        validation_0-logloss:0.45437
[3]
                                         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
                                         validation_0-error:0.04614
[5]
        validation_0-logloss:0.38385
validation 1-logloss:0.39418
                                 validation 1-error:0.06447
        validation_0-logloss:0.35538
                                         validation 0-error:0.04539
validation 1-logloss:0.36566
                                 validation 1-error:0.06297
        validation_0-logloss:0.33069
                                         validation_0-error:0.04501
validation_1-logloss:0.34228
                                 validation 1-error:0.06297
[8]
        validation_0-logloss:0.30717
                                         validation_0-error:0.04501
validation_1-logloss:0.31941
                                 validation_1-error:0.06297
        validation_0-logloss:0.28698
                                         validation_0-error:0.04426
[9]
validation_1-logloss:0.29997
                                 validation_1-error:0.06297
[10]
        validation_0-logloss:0.26928
                                         validation_0-error:0.04276
validation_1-logloss:0.28309
                                 validation_1-error:0.06147
[11]
        validation_0-logloss:0.25326
                                         validation_0-error:0.03901
                                 validation_1-error:0.05847
validation_1-logloss:0.26720
[12]
        validation_0-logloss:0.23927
                                         validation_0-error:0.03751
validation_1-logloss:0.25365
                                 validation 1-error:0.05247
        validation 0-logloss:0.22708
                                         validation 0-error:0.03751
validation 1-logloss:0.24224
                                 validation 1-error:0.05397
        validation 0-logloss:0.21613
                                         validation 0-error:0.03751
[14]
validation_1-logloss:0.23222
                                 validation 1-error:0.05397
        validation_0-logloss:0.20626
                                         validation_0-error:0.03638
[15]
validation_1-logloss:0.22340
                                 validation 1-error:0.05397
        validation_0-logloss:0.19709
                                         validation_0-error:0.03638
[16]
validation_1-logloss:0.21558
                                 validation_1-error:0.05547
[17]
        validation_0-logloss:0.18958
                                         validation_0-error:0.03601
validation_1-logloss:0.20893
                                 validation 1-error:0.05247
        validation_0-logloss:0.18252
[18]
                                         validation_0-error:0.03451
validation_1-logloss:0.20247
                                 validation_1-error:0.05097
[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
validation_1-logloss:0.19252
                                 validation_1-error:0.04798
        validation_0-logloss:0.16594
[21]
                                         validation_0-error:0.03413
validation_1-logloss:0.18831
                                 validation 1-error:0.04798
[22]
        validation 0-logloss:0.16169
                                         validation 0-error:0.03338
validation 1-logloss:0.18463
                                 validation 1-error:0.04798
        validation 0-logloss:0.15795
                                         validation 0-error:0.03301
validation_1-logloss:0.18200
                                 validation 1-error:0.04947
[24]
        validation_0-logloss:0.15417
                                         validation 0-error:0.03301
validation_1-logloss:0.17755
                                 validation_1-error:0.04798
        validation_0-logloss:0.15071
                                         validation_0-error:0.03263
[25]
validation_1-logloss:0.17556
                                 validation_1-error:0.04798
        validation_0-logloss:0.14747
                                         validation_0-error:0.03188
[26]
validation_1-logloss:0.17204
                                 validation 1-error:0.04798
        validation_0-logloss:0.14470
[27]
                                         validation_0-error:0.03076
validation_1-logloss:0.16952
                                 validation_1-error:0.04798
[28]
        validation_0-logloss:0.14194
                                         validation_0-error:0.03113
validation_1-logloss:0.16635
                                 validation_1-error:0.04798
[29]
        validation 0-logloss:0.13873
                                         validation_0-error:0.03076
validation 1-logloss:0.16463
                                 validation 1-error:0.04798
        validation 0-logloss:0.13655
                                         validation 0-error:0.03076
validation 1-logloss:0.16275
                                 validation 1-error:0.04798
[31]
        validation_0-logloss:0.13368
                                         validation_0-error:0.03076
validation_1-logloss:0.16142
                                 validation 1-error:0.04798
[32]
        validation_0-logloss:0.13139
                                         validation_0-error:0.03038
validation_1-logloss:0.15977
                                 validation_1-error:0.04648
        validation_0-logloss:0.12956
                                         validation_0-error:0.03001
[33]
validation_1-logloss:0.15889
                                 validation_1-error:0.04648
[34]
        validation_0-logloss:0.12808
                                         validation 0-error:0.03001
validation_1-logloss:0.15880
                                 validation_1-error:0.04648
[35]
        validation_0-logloss:0.12644
                                         validation_0-error:0.03001
validation_1-logloss:0.15686
                                 validation_1-error:0.04648
[36]
        validation_0-logloss:0.12481
                                         validation_0-error:0.02926
validation 1-logloss:0.15544
                                 validation 1-error:0.04498
        validation 0-logloss:0.12374
                                         validation 0-error:0.02926
validation 1-logloss:0.15513
                                 validation 1-error:0.04648
        validation 0-logloss:0.12191
                                         validation 0-error:0.02888
[38]
validation_1-logloss:0.15450
                                 validation 1-error:0.04498
[39]
        validation_0-logloss:0.12061
                                         validation_0-error:0.02851
validation_1-logloss:0.15375
                                 validation 1-error:0.04348
        validation_0-logloss:0.11919
                                         validation_0-error:0.02851
[40]
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
        validation_0-logloss:0.11616
[42]
                                         validation_0-error:0.02851
validation_1-logloss:0.15325
                                 validation_1-error:0.04348
[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
validation_1-logloss:0.15325
                                 validation_1-error:0.04348
        validation_0-logloss:0.11299
[45]
                                         validation_0-error:0.02813
validation_1-logloss:0.15316
                                 validation 1-error:0.04498
Γ467
        validation 0-logloss:0.11233
                                         validation 0-error:0.02776
validation 1-logloss:0.15310
                                 validation 1-error:0.04498
        validation 0-logloss:0.11137
                                         validation 0-error:0.02776
validation_1-logloss:0.15354
                                 validation 1-error:0.04498
[48]
        validation_0-logloss:0.11046
                                         validation 0-error:0.02776
validation_1-logloss:0.15316
                                 validation_1-error:0.04498
        validation_0-logloss:0.10909
                                         validation_0-error:0.02738
[49]
validation_1-logloss:0.15295
                                 validation_1-error:0.04498
        validation_0-logloss:0.61605
                                         validation_0-error:0.04801
[0]
validation_1-logloss:0.61867
                                 validation 1-error:0.06447
        validation_0-logloss:0.55288
[1]
                                         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
        validation_0-logloss:0.41734
                                         validation 0-error:0.04726
validation 1-logloss:0.42669
                                 validation 1-error:0.06147
        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
        validation_0-logloss:0.33133
                                         validation_0-error:0.04689
[7]
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-error:0.06297
validation_1-logloss:0.29934
[10]
        validation_0-logloss:0.26928
                                         validation_0-error:0.04539
validation_1-logloss:0.28167
                                 validation 1-error:0.05997
        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
        validation_0-logloss:0.22691
                                         validation_0-error:0.04239
[13]
validation_1-logloss:0.24068
                                 validation 1-error:0.05247
        validation_0-logloss:0.21621
                                         validation_0-error:0.03976
[14]
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
        validation_0-logloss:0.19709
[16]
                                         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
        validation_0-logloss:0.17640
                                        validation_0-error:0.03151
[19]
validation 1-logloss:0.19296
                                validation 1-error:0.04198
        validation 0-logloss:0.17058
                                         validation 0-error:0.03076
[20]
validation 1-logloss:0.18783
                                validation 1-error:0.04048
        validation 0-logloss:0.16612
                                         validation 0-error:0.03076
validation_1-logloss:0.18293
                                validation 1-error:0.04048
        validation_0-logloss:0.16141
                                         validation 0-error:0.03076
[22]
validation_1-logloss:0.17966
                                validation_1-error:0.03898
        validation_0-logloss:0.15784
[23]
                                         validation_0-error:0.03038
validation_1-logloss:0.17574
                                validation_1-error:0.03898
        validation_0-logloss:0.15410
                                         validation_0-error:0.03001
[24]
validation 1-logloss:0.17437
                                validation_1-error:0.03898
        validation_0-logloss:0.15067
[25]
                                         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
        validation_0-logloss:0.14433
                                        validation_0-error:0.02963
validation_1-logloss:0.16648
                                validation_1-error:0.03898
        validation_0-logloss:0.14134
                                         validation 0-error:0.02926
[28]
validation 1-logloss:0.16449
                                validation 1-error:0.03898
        validation 0-logloss:0.13885
[29]
                                         validation 0-error:0.02851
validation 1-logloss:0.16222
                                validation 1-error:0.03898
        validation_0-logloss:0.13593
                                         validation 0-error:0.02813
[30]
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
        validation_0-logloss:0.13144
                                         validation_0-error:0.02738
[32]
validation_1-logloss:0.15701
                                validation_1-error:0.03898
        validation_0-logloss:0.12927
                                         validation_0-error:0.02851
[33]
validation_1-logloss:0.15500
                                validation_1-error:0.03898
        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
        validation_0-logloss:0.11402
                                         validation_0-error:0.02701
[42]
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
Γ451
        validation 0-logloss:0.11073
                                         validation 0-error:0.02701
validation 1-logloss:0.14640
                                 validation 1-error:0.03598
        validation 0-logloss:0.10943
                                         validation 0-error:0.02663
[46]
validation_1-logloss:0.14610
                                 validation 1-error:0.03748
        validation_0-logloss:0.10877
                                         validation_0-error:0.02663
[47]
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
        validation_0-logloss:0.10673
                                         validation_0-error:0.02663
[49]
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
        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
        validation 0-logloss:0.10301
[53]
                                         validation 0-error:0.02588
validation 1-logloss:0.14545
                                 validation 1-error:0.03898
Γ541
        validation_0-logloss:0.10225
                                         validation 0-error:0.02551
validation_1-logloss:0.14566
                                 validation_1-error:0.03748
        validation_0-logloss:0.10191
                                         validation_0-error:0.02513
[55]
validation_1-logloss:0.14552
                                 validation_1-error:0.03748
        validation_0-logloss:0.10129
                                         validation_0-error:0.02513
[56]
validation_1-logloss:0.14504
                                 validation_1-error:0.03748
        validation_0-logloss:0.10070
                                         validation_0-error:0.02476
[57]
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
        validation_0-logloss:0.09876
                                         validation_0-error:0.02476
[61]
validation 1-logloss:0.14457
                                 validation 1-error:0.03748
[62]
        validation 0-logloss:0.09844
                                         validation 0-error:0.02513
                                 validation_1-error:0.03748
validation 1-logloss:0.14492
[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
        validation_0-logloss:0.09610
                                         validation_0-error:0.02363
[66]
validation_1-logloss:0.14425
                                 validation_1-error:0.03748
[67]
        validation_0-logloss:0.09566
                                         validation_0-error:0.02363
validation_1-logloss:0.14385
                                 validation_1-error:0.03748
[68]
        validation_0-logloss:0.09482
                                         validation_0-error:0.02401
validation_1-logloss:0.14378
                                 validation 1-error:0.03748
[69]
        validation 0-logloss:0.09387
                                         validation 0-error:0.02363
validation 1-logloss:0.14406
                                 validation 1-error:0.03748
        validation 0-logloss:0.09341
                                         validation 0-error:0.02363
[70]
validation_1-logloss:0.14418
                                 validation_1-error:0.03748
        validation_0-logloss:0.09266
                                         validation 0-error:0.02326
[71]
validation_1-logloss:0.14388
                                 validation_1-error:0.03748
[72]
        validation_0-logloss:0.09238
                                         validation_0-error:0.02326
validation_1-logloss:0.14388
                                 validation_1-error:0.03748
        validation_0-logloss:0.09173
[73]
                                         validation_0-error:0.02326
validation_1-logloss:0.14405
                                 validation 1-error:0.03898
[74]
        validation_0-logloss:0.09108
                                         validation_0-error:0.02326
validation_1-logloss:0.14392
                                 validation_1-error:0.03898
        validation_0-logloss:0.61565
[0]
                                         validation_0-error:0.04839
validation_1-logloss:0.61723
                                 validation_1-error:0.05997
        validation_0-logloss:0.55172
                                         validation_0-error:0.04539
[1]
validation 1-logloss:0.55447
                                 validation 1-error:0.05697
        validation 0-logloss:0.49874
[2]
                                         validation 0-error:0.04651
validation 1-logloss:0.50336
                                 validation 1-error:0.05997
        validation_0-logloss:0.45368
                                         validation 0-error:0.04539
validation_1-logloss:0.45917
                                 validation_1-error:0.05697
        validation_0-logloss:0.41537
[4]
                                         validation_0-error:0.04539
validation_1-logloss:0.42147
                                 validation_1-error:0.05097
        validation_0-logloss:0.38260
                                         validation_0-error:0.04501
[5]
validation_1-logloss:0.38868
                                 validation_1-error:0.05397
        validation_0-logloss:0.35419
                                         validation_0-error:0.04501
[6]
validation_1-logloss:0.36148
                                 validation_1-error:0.05247
        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
        validation_0-logloss:0.28619
                                         validation_0-error:0.04426
[9]
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
        validation 0-logloss:0.25348
                                         validation 0-error:0.04314
[11]
validation 1-logloss:0.26139
                                 validation 1-error:0.05397
Γ12]
        validation_0-logloss:0.23986
                                         validation 0-error:0.04201
validation 1-logloss:0.24795
                                 validation 1-error:0.04947
                                         validation_0-error:0.03939
[13]
        validation_0-logloss:0.22768
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
        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
Г187
        validation 0-logloss:0.18282
                                         validation 0-error:0.03788
validation 1-logloss:0.19690
                                 validation 1-error:0.04198
        validation 0-logloss:0.17621
                                         validation 0-error:0.03713
[19]
validation_1-logloss:0.19145
                                 validation_1-error:0.04198
        validation_0-logloss:0.17032
                                         validation 0-error:0.03676
[20]
validation_1-logloss:0.18670
                                 validation_1-error:0.04348
        validation_0-logloss:0.16521
                                         validation_0-error:0.03713
[21]
validation_1-logloss:0.18335
                                 validation_1-error:0.04348
        validation_0-logloss:0.16126
[22]
                                         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
        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
        validation 0-logloss:0.14739
[26]
                                         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
        validation_0-logloss:0.14180
[28]
                                         validation 0-error:0.03263
validation_1-logloss:0.16062
                                 validation_1-error:0.03898
        validation_0-logloss:0.13945
[29]
                                         validation_0-error:0.03226
validation_1-logloss:0.15940
                                 validation_1-error:0.04048
        validation_0-logloss:0.13661
                                         validation_0-error:0.03151
[30]
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
                                         validation_0-error:0.03038
[37]
        validation_0-logloss:0.12542
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
        validation_0-logloss:0.12346
                                         validation_0-error:0.03038
[39]
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
        validation 0-logloss:0.11957
                                         validation 0-error:0.02963
[43]
validation_1-logloss:0.14834
                                 validation 1-error:0.03598
        validation_0-logloss:0.11822
                                         validation 0-error:0.02963
[44]
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
        validation_0-logloss:0.11565
[46]
                                         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
        validation 0-logloss:0.11158
[50]
                                         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
        validation_0-logloss:0.10954
[52]
                                         validation 0-error:0.02888
validation_1-logloss:0.14648
                                 validation_1-error:0.03448
        validation_0-logloss:0.10872
                                         validation_0-error:0.02888
[53]
validation_1-logloss:0.14662
                                 validation_1-error:0.03448
        validation_0-logloss:0.10799
                                         validation_0-error:0.02813
[54]
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
        validation_0-logloss:0.10564
                                         validation_0-error:0.02813
[57]
validation_1-logloss:0.14627
                                validation_1-error:0.03448
        validation 0-logloss:0.10476
                                         validation_0-error:0.02813
[58]
validation 1-logloss:0.14656
                                validation 1-error:0.03448
        validation 0-logloss:0.10422
                                         validation 0-error:0.02776
[59]
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
        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
        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
        validation_0-logloss:0.10150
                                         validation_0-error:0.02701
[65]
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
        validation 0-logloss:0.10011
                                         validation 0-error:0.02626
[67]
validation_1-logloss:0.14655
                                validation_1-error:0.03598
        validation 0-logloss:0.09961
                                         validation_0-error:0.02626
[68]
validation_1-logloss:0.14649
                                validation_1-error:0.03748
        validation_0-logloss:0.09871
                                         validation_0-error:0.02663
[69]
validation_1-logloss:0.14688
                                validation_1-error:0.03748
        validation_0-logloss:0.09811
[70]
                                        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
        validation_0-logloss:0.09660
                                         validation_0-error:0.02663
[73]
validation 1-logloss:0.14742
                                validation 1-error:0.03598
        validation 0-logloss:0.09541
Γ741
                                         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 validation_0-logloss:0.55295 validation_0-error:0.05326 [1] validation_1-logloss:0.55393 validation_1-error:0.05247 validation_0-logloss:0.50032 validation 0-error:0.05326 [2] 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 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 validation_0-logloss:0.35259 validation_0-error:0.04276 [6] 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 validation_0-logloss:0.30413 validation_0-error:0.04051 validation_1-logloss:0.31113 validation 1-error:0.05847 validation_0-logloss:0.28422 validation_0-error:0.03751 [9] validation 1-logloss:0.29215 validation 1-error:0.05097 validation_0-logloss:0.26682 validation_0-error:0.03526 [10] validation 1-logloss:0.27571 validation 1-error:0.04798 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 validation_0-logloss:0.22547 validation_0-error:0.03413 [13] validation_1-logloss:0.23799 validation_1-error:0.04498 validation_0-logloss:0.21454 validation_0-error:0.03413 [14]validation_1-logloss:0.22846 validation_1-error:0.04348 validation_0-logloss:0.20512 validation_0-error:0.03226 validation_1-logloss:0.22055 validation_1-error:0.04648 **Г16**Ъ validation_0-logloss:0.19640 validation_0-error:0.03113 validation_1-logloss:0.21244 validation_1-error:0.04498 validation_0-logloss:0.18903 validation 0-error:0.03113 [17] validation_1-logloss:0.20558 validation_1-error:0.04498 validation_0-logloss:0.18243 validation 0-error:0.03113 Г187 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 validation_0-logloss:0.17098 [20] 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
        validation 0-logloss:0.15038
                                         validation 0-error:0.02851
[25]
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
        validation_0-logloss:0.13936
                                         validation_0-error:0.02813
[29]
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
        validation_0-logloss:0.13512
                                         validation_0-error:0.02701
[31]
validation_1-logloss:0.16072
                                 validation 1-error:0.04348
Γ321
        validation 0-logloss:0.13202
                                         validation 0-error:0.02701
                                 validation 1-error:0.04198
validation 1-logloss:0.15937
        validation 0-logloss:0.12931
[33]
                                         validation 0-error:0.02701
validation_1-logloss:0.15878
                                 validation_1-error:0.04198
        validation_0-logloss:0.12746
                                         validation 0-error:0.02626
[34]
validation_1-logloss:0.15680
                                 validation_1-error:0.04198
        validation_0-logloss:0.12490
                                         validation_0-error:0.02663
[35]
validation_1-logloss:0.15596
                                 validation_1-error:0.04198
        validation_0-logloss:0.12353
[36]
                                         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
        validation_0-logloss:0.12040
[38]
                                         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
        validation 0-logloss:0.11850
[40]
                                         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
        validation_0-logloss:0.11494
                                         validation_0-error:0.02701
[43]
validation_1-logloss:0.15204
                                 validation_1-error:0.03748
        validation_0-logloss:0.11429
                                         validation_0-error:0.02738
[44]
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
        validation_0-logloss:0.10999
                                         validation_0-error:0.02738
[48]
validation 1-logloss:0.14805
                                 validation 1-error:0.03748
        validation 0-logloss:0.10954
                                         validation 0-error:0.02738
[49]
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
        validation_0-logloss:0.10703
                                         validation_0-error:0.02738
[53]
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
Γ561
        validation 0-logloss:0.10431
                                         validation 0-error:0.02776
validation 1-logloss:0.14674
                                 validation 1-error:0.03748
        validation 0-logloss:0.10386
[57]
                                         validation 0-error:0.02776
validation_1-logloss:0.14666
                                 validation_1-error:0.03748
        validation 0-logloss:0.10358
                                         validation 0-error:0.02738
[58]
validation_1-logloss:0.14688
                                 validation_1-error:0.03748
        validation_0-logloss:0.10261
                                         validation_0-error:0.02738
[59]
validation_1-logloss:0.14724
                                 validation_1-error:0.03598
        validation_0-logloss:0.10227
[60]
                                         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
        validation_0-logloss:0.10090
[62]
                                         validation_0-error:0.02738
validation_1-logloss:0.14780
                                 validation_1-error:0.03748
        validation_0-logloss:0.10043
                                         validation_0-error:0.02738
[63]
validation 1-logloss:0.14818
                                 validation 1-error:0.03748
        validation 0-logloss:0.09935
[64]
                                         validation 0-error:0.02738
validation 1-logloss:0.14845
                                 validation 1-error:0.03598
[65]
        validation_0-logloss:0.09880
                                         validation 0-error:0.02738
validation_1-logloss:0.14866
                                 validation_1-error:0.03448
        validation_0-logloss:0.09817
[66]
                                         validation_0-error:0.02738
validation_1-logloss:0.14854
                                 validation_1-error:0.03598
        validation_0-logloss:0.09764
                                         validation_0-error:0.02738
[67]
validation_1-logloss:0.14865
                                 validation_1-error:0.03598
        validation_0-logloss:0.09714
                                         validation_0-error:0.02738
[68]
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
        validation_0-logloss:0.09483
                                         validation 0-error:0.02701
[73]
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
                                         validation_0-error:0.04989
        validation_0-logloss:0.61545
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
        validation_0-logloss:0.49845
                                         validation_0-error:0.04839
validation_1-logloss:0.50531
                                 validation_1-error:0.07196
        validation_0-logloss:0.45329
                                         validation_0-error:0.04764
[3]
validation_1-logloss:0.46160
                                 validation_1-error:0.07196
        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
        validation 0-logloss:0.35303
[6]
                                         validation 0-error:0.04689
validation_1-logloss:0.36511
                                 validation_1-error:0.07046
        validation_0-logloss:0.32795
                                         validation_0-error:0.04614
[7]
validation_1-logloss:0.34127
                                 validation_1-error:0.06897
        validation_0-logloss:0.30618
                                         validation_0-error:0.04239
[8]
validation_1-logloss:0.32055
                                 validation_1-error:0.05997
        validation_0-logloss:0.28742
[9]
                                         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
        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
        validation 0-logloss:0.22826
[13]
                                         validation 0-error:0.03939
validation 1-logloss:0.24613
                                 validation 1-error:0.05697
Γ147
        validation_0-logloss:0.21746
                                         validation 0-error:0.04013
validation_1-logloss:0.23526
                                 validation_1-error:0.05547
        validation_0-logloss:0.20794
[15]
                                         validation_0-error:0.03976
validation_1-logloss:0.22565
                                 validation_1-error:0.05397
        validation_0-logloss:0.19957
                                         validation_0-error:0.03788
[16]
validation_1-logloss:0.21822
                                 validation_1-error:0.05397
        validation_0-logloss:0.19145
                                         validation_0-error:0.03751
[17]
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
                                         validation_0-error:0.03601
[24]
        validation_0-logloss:0.15471
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
        validation_0-logloss:0.14689
                                         validation_0-error:0.03488
[26]
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
        validation 0-logloss:0.13725
[30]
                                         validation 0-error:0.03226
validation_1-logloss:0.17107
                                 validation 1-error:0.04498
        validation_0-logloss:0.13425
                                         validation 0-error:0.03151
[31]
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
        validation_0-logloss:0.13064
[33]
                                         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
        validation_0-logloss:0.12625
[35]
                                         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
        validation 0-logloss:0.12311
[37]
                                         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
        validation_0-logloss:0.12035
[39]
                                         validation 0-error:0.03151
validation_1-logloss:0.16350
                                 validation_1-error:0.04048
        validation_0-logloss:0.11922
[40]
                                         validation_0-error:0.03151
validation_1-logloss:0.16378
                                 validation_1-error:0.04048
        validation_0-logloss:0.11848
                                         validation_0-error:0.03113
[41]
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
        validation 0-logloss:0.11199
                                         validation 0-error:0.03001
[46]
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
        validation_0-logloss:0.10983
[48]
                                         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
        validation_0-logloss:0.10814
                                         validation_0-error:0.02926
[50]
validation_1-logloss:0.16025
                                 validation_1-error:0.04348
[51]
        validation_0-logloss:0.10761
                                         validation_0-error:0.02926
validation_1-logloss:0.15997
                                 validation_1-error:0.04498
[52]
        validation_0-logloss:0.10693
                                         validation_0-error:0.02926
validation_1-logloss:0.16066
                                 validation 1-error:0.04498
Γ531
        validation 0-logloss:0.10624
                                         validation 0-error:0.02926
validation 1-logloss:0.16084
                                 validation 1-error:0.04798
        validation 0-logloss:0.10506
                                         validation 0-error:0.02851
[54]
validation_1-logloss:0.16065
                                 validation 1-error:0.04798
        validation_0-logloss:0.10413
                                         validation_0-error:0.02813
[55]
validation_1-logloss:0.16105
                                 validation_1-error:0.04498
        validation_0-logloss:0.10366
                                         validation_0-error:0.02813
[56]
validation_1-logloss:0.16142
                                 validation_1-error:0.04498
        validation_0-logloss:0.10327
[57]
                                         validation_0-error:0.02776
validation_1-logloss:0.16175
                                 validation 1-error:0.04648
[58]
        validation_0-logloss:0.10293
                                         validation_0-error:0.02776
validation_1-logloss:0.16102
                                 validation_1-error:0.04648
        validation_0-logloss:0.10228
[59]
                                         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
        validation 0-logloss:0.10044
[61]
                                         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
        validation_0-logloss:0.09903
                                         validation 0-error:0.02663
[63]
validation_1-logloss:0.16182
                                 validation_1-error:0.04648
        validation_0-logloss:0.09867
[64]
                                         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
        validation_0-logloss:0.09580
                                         validation_0-error:0.02626
[68]
validation_1-logloss:0.16131
                                validation_1-error:0.04498
        validation 0-logloss:0.09546
                                         validation_0-error:0.02588
[69]
validation 1-logloss:0.16145
                                validation 1-error:0.04498
        validation 0-logloss:0.09519
                                         validation 0-error:0.02588
[70]
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
        validation_0-logloss:0.09349
                                        validation 0-error:0.02551
validation_1-logloss:0.16047
                                validation_1-error:0.04648
        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)
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:0.55229
                                         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
        validation 0-logloss:0.45437
                                         validation 0-error:0.04689
validation 1-logloss:0.46189
                                validation 1-error:0.06597
        validation 0-logloss:0.41662
                                         validation 0-error:0.04539
validation_1-logloss:0.42536
                                validation 1-error:0.06447
        validation_0-logloss:0.38385
                                         validation_0-error:0.04614
[5]
validation_1-logloss:0.39418
                                validation 1-error:0.06447
        validation_0-logloss:0.35538
                                         validation_0-error:0.04539
validation_1-logloss:0.36566
                                validation_1-error:0.06297
        validation_0-logloss:0.33069
                                         validation_0-error:0.04501
validation_1-logloss:0.34228
                                validation 1-error:0.06297
[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
validation_1-logloss:0.28309
                                 validation_1-error:0.06147
        validation_0-logloss:0.25326
[11]
                                         validation_0-error:0.03901
validation_1-logloss:0.26720
                                 validation 1-error:0.05847
Γ127
        validation 0-logloss:0.23927
                                         validation 0-error:0.03751
validation 1-logloss:0.25365
                                 validation 1-error:0.05247
        validation 0-logloss:0.22708
                                         validation 0-error:0.03751
validation_1-logloss:0.24224
                                 validation 1-error:0.05397
        validation_0-logloss:0.21613
                                         validation 0-error:0.03751
[14]
validation_1-logloss:0.23222
                                 validation_1-error:0.05397
        validation_0-logloss:0.20626
                                         validation_0-error:0.03638
[15]
validation_1-logloss:0.22340
                                 validation_1-error:0.05397
        validation_0-logloss:0.19709
[16]
                                         validation_0-error:0.03638
validation_1-logloss:0.21558
                                 validation_1-error:0.05547
        validation_0-logloss:0.18958
[17]
                                         validation_0-error:0.03601
validation_1-logloss:0.20893
                                 validation_1-error:0.05247
[18]
        validation_0-logloss:0.18252
                                         validation_0-error:0.03451
validation_1-logloss:0.20247
                                 validation_1-error:0.05097
[19]
        validation_0-logloss:0.17668
                                         validation_0-error:0.03413
validation 1-logloss:0.19726
                                 validation 1-error:0.04798
                                         validation 0-error:0.03451
        validation_0-logloss:0.17124
validation 1-logloss:0.19252
                                 validation 1-error:0.04798
[21]
        validation_0-logloss:0.16594
                                         validation_0-error:0.03413
validation 1-logloss:0.18831
                                 validation_1-error:0.04798
[22]
        validation_0-logloss:0.16169
                                         validation_0-error:0.03338
validation_1-logloss:0.18463
                                 validation_1-error:0.04798
        validation_0-logloss:0.15795
                                         validation_0-error:0.03301
[23]
validation_1-logloss:0.18200
                                 validation_1-error:0.04947
        validation_0-logloss:0.15417
                                         validation_0-error:0.03301
[24]
validation_1-logloss:0.17755
                                 validation_1-error:0.04798
[25]
        validation_0-logloss:0.15071
                                         validation_0-error:0.03263
validation_1-logloss:0.17556
                                 validation_1-error:0.04798
[26]
        validation_0-logloss:0.14747
                                         validation_0-error:0.03188
validation_1-logloss:0.17204
                                 validation 1-error:0.04798
        validation 0-logloss:0.14470
                                         validation 0-error:0.03076
validation 1-logloss:0.16952
                                 validation 1-error:0.04798
        validation 0-logloss:0.14194
                                         validation 0-error:0.03113
[28]
validation_1-logloss:0.16635
                                 validation 1-error:0.04798
        validation_0-logloss:0.13873
                                         validation_0-error:0.03076
[29]
validation_1-logloss:0.16463
                                 validation 1-error:0.04798
        validation_0-logloss:0.13655
                                         validation_0-error:0.03076
[30]
validation_1-logloss:0.16275
                                 validation_1-error:0.04798
[31]
        validation_0-logloss:0.13368
                                         validation_0-error:0.03076
validation_1-logloss:0.16142
                                 validation 1-error:0.04798
        validation_0-logloss:0.13139
[32]
                                         validation_0-error:0.03038
validation_1-logloss:0.15977
                                 validation_1-error:0.04648
[33]
        validation_0-logloss:0.12956
                                         validation_0-error:0.03001
validation_1-logloss:0.15889
                                 validation_1-error:0.04648
```

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[34]
        validation_0-logloss:0.12808
                                         validation_0-error:0.03001
validation_1-logloss:0.15880
                                 validation_1-error:0.04648
        validation_0-logloss:0.12644
                                         validation_0-error:0.03001
[35]
validation_1-logloss:0.15686
                                 validation 1-error:0.04648
        validation 0-logloss:0.12481
                                         validation 0-error:0.02926
[36]
validation 1-logloss:0.15544
                                 validation 1-error:0.04498
        validation 0-logloss:0.12374
                                         validation 0-error:0.02926
validation_1-logloss:0.15513
                                 validation 1-error:0.04648
[38]
        validation_0-logloss:0.12191
                                         validation 0-error:0.02888
validation_1-logloss:0.15450
                                 validation_1-error:0.04498
        validation_0-logloss:0.12061
                                         validation_0-error:0.02851
[39]
validation_1-logloss:0.15375
                                 validation_1-error:0.04348
        validation_0-logloss:0.11919
[40]
                                         validation_0-error:0.02851
validation_1-logloss:0.15351
                                 validation 1-error:0.04498
        validation_0-logloss:0.11792
[41]
                                         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
validation_1-logloss:0.15325
                                 validation_1-error:0.04348
[43]
        validation_0-logloss:0.11539
                                         validation_0-error:0.02851
validation 1-logloss:0.15381
                                 validation 1-error:0.04498
        validation 0-logloss:0.11381
                                         validation 0-error:0.02813
validation 1-logloss:0.15325
                                 validation 1-error:0.04348
        validation_0-logloss:0.11299
                                         validation_0-error:0.02813
validation_1-logloss:0.15316
                                 validation_1-error:0.04498
[46]
        validation_0-logloss:0.11233
                                         validation_0-error:0.02776
validation_1-logloss:0.15310
                                 validation_1-error:0.04498
[47]
        validation_0-logloss:0.11137
                                         validation_0-error:0.02776
validation_1-logloss:0.15354
                                 validation_1-error:0.04498
[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
validation_1-logloss:0.15295
                                 validation_1-error:0.04498
[50]
        validation_0-logloss:0.10767
                                         validation_0-error:0.02738
validation 1-logloss:0.15349
                                 validation 1-error:0.04498
        validation 0-logloss:0.10705
                                         validation 0-error:0.02738
[51]
validation 1-logloss:0.15326
                                 validation 1-error:0.04498
[52]
        validation 0-logloss:0.10666
                                         validation 0-error:0.02738
validation_1-logloss:0.15358
                                 validation 1-error:0.04498
        validation_0-logloss:0.10577
                                         validation_0-error:0.02738
[53]
validation_1-logloss:0.15371
                                 validation 1-error:0.04498
        validation_0-logloss:0.10462
                                         validation_0-error:0.02663
[54]
validation_1-logloss:0.15440
                                 validation_1-error:0.04348
[55]
        validation_0-logloss:0.10396
                                         validation_0-error:0.02701
validation_1-logloss:0.15412
                                 validation 1-error:0.04348
        validation_0-logloss:0.10323
[56]
                                         validation_0-error:0.02663
validation_1-logloss:0.15455
                                 validation_1-error:0.04348
[57]
        validation_0-logloss:0.10224
                                         validation_0-error:0.02701
validation_1-logloss:0.15417
                                 validation_1-error:0.04348
```

```
[58]
        validation_0-logloss:0.10204
                                         validation_0-error:0.02663
validation_1-logloss:0.15435
                                 validation_1-error:0.04198
        validation_0-logloss:0.10147
[59]
                                         validation_0-error:0.02701
validation_1-logloss:0.15435
                                 validation 1-error:0.04348
        validation 0-logloss:0.10080
                                         validation 0-error:0.02626
[60]
validation 1-logloss:0.15421
                                 validation 1-error:0.04348
        validation 0-logloss:0.10037
                                         validation 0-error:0.02663
validation_1-logloss:0.15423
                                 validation 1-error:0.04648
[62]
        validation_0-logloss:0.09975
                                         validation 0-error:0.02626
validation_1-logloss:0.15423
                                 validation_1-error:0.04648
        validation_0-logloss:0.09906
                                         validation_0-error:0.02626
[63]
validation_1-logloss:0.15441
                                 validation_1-error:0.04648
        validation_0-logloss:0.09853
[64]
                                         validation_0-error:0.02626
validation_1-logloss:0.15389
                                 validation_1-error:0.04498
        validation_0-logloss:0.09744
[65]
                                         validation_0-error:0.02626
validation_1-logloss:0.15401
                                 validation_1-error:0.04348
[66]
        validation_0-logloss:0.09691
                                         validation_0-error:0.02663
validation_1-logloss:0.15388
                                 validation_1-error:0.04498
[67]
        validation_0-logloss:0.09624
                                         validation_0-error:0.02626
validation 1-logloss:0.15323
                                 validation 1-error:0.04348
        validation_0-logloss:0.09565
                                         validation 0-error:0.02626
validation 1-logloss:0.15304
                                 validation 1-error:0.04198
        validation_0-logloss:0.09527
                                         validation_0-error:0.02626
validation_1-logloss:0.15303
                                 validation_1-error:0.04198
[70]
        validation_0-logloss:0.09464
                                         validation_0-error:0.02663
validation_1-logloss:0.15263
                                 validation_1-error:0.04048
        validation_0-logloss:0.09430
                                         validation_0-error:0.02626
[71]
validation_1-logloss:0.15253
                                 validation_1-error:0.04048
[72]
        validation_0-logloss:0.09326
                                         validation_0-error:0.02663
validation_1-logloss:0.15278
                                 validation_1-error:0.04048
[73]
        validation_0-logloss:0.09259
                                         validation_0-error:0.02626
                                 validation_1-error:0.04048
validation_1-logloss:0.15272
[74]
        validation_0-logloss:0.09222
                                         validation_0-error:0.02626
validation_1-logloss:0.15290
                                 validation 1-error:0.04048
        validation 0-logloss:0.61605
                                         validation 0-error:0.04801
validation 1-logloss:0.61867
                                 validation 1-error:0.06447
        validation 0-logloss:0.55288
                                         validation 0-error:0.04726
validation_1-logloss:0.55768
                                 validation 1-error:0.06147
        validation_0-logloss:0.50018
                                         validation_0-error:0.04764
[2]
validation_1-logloss:0.50634
                                 validation 1-error:0.06297
        validation_0-logloss:0.45547
                                         validation_0-error:0.04726
[3]
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
        validation_0-logloss:0.38440
[5]
                                         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
        validation_0-logloss:0.30817
                                         validation_0-error:0.04726
[8]
validation_1-logloss:0.31959
                                 validation 1-error:0.06297
        validation 0-logloss:0.28743
                                         validation 0-error:0.04689
[9]
validation 1-logloss:0.29934
                                 validation 1-error:0.06297
        validation 0-logloss:0.26928
                                         validation 0-error:0.04539
validation_1-logloss:0.28167
                                 validation 1-error:0.05997
        validation_0-logloss:0.25376
                                         validation 0-error:0.04163
[11]
validation_1-logloss:0.26623
                                 validation_1-error:0.05247
        validation_0-logloss:0.23946
                                         validation_0-error:0.04163
[12]
validation_1-logloss:0.25274
                                 validation_1-error:0.05097
        validation_0-logloss:0.22691
[13]
                                         validation_0-error:0.04239
validation_1-logloss:0.24068
                                 validation_1-error:0.05247
        validation_0-logloss:0.21621
[14]
                                         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
        validation_0-logloss:0.18923
                                         validation 0-error:0.03601
validation 1-logloss:0.20516
                                 validation 1-error:0.04198
        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
        validation_0-logloss:0.17058
                                         validation_0-error:0.03076
[20]
validation_1-logloss:0.18783
                                 validation_1-error:0.04048
        validation_0-logloss:0.16612
                                         validation_0-error:0.03076
[21]
validation_1-logloss:0.18293
                                 validation_1-error:0.04048
[22]
        validation_0-logloss:0.16141
                                         validation_0-error:0.03076
                                 validation_1-error:0.03898
validation_1-logloss:0.17966
[23]
        validation_0-logloss:0.15784
                                         validation_0-error:0.03038
validation_1-logloss:0.17574
                                 validation 1-error:0.03898
        validation 0-logloss:0.15410
                                         validation 0-error:0.03001
validation 1-logloss:0.17437
                                 validation 1-error:0.03898
        validation 0-logloss:0.15067
                                         validation 0-error:0.03001
[25]
validation_1-logloss:0.17091
                                 validation 1-error:0.03898
        validation_0-logloss:0.14731
                                         validation_0-error:0.03001
[26]
validation_1-logloss:0.16930
                                 validation 1-error:0.03898
        validation_0-logloss:0.14433
                                         validation_0-error:0.02963
[27]
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
        validation_0-logloss:0.13885
[29]
                                         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
        validation_0-logloss:0.13144
[32]
                                         validation_0-error:0.02738
validation_1-logloss:0.15701
                                 validation 1-error:0.03898
        validation 0-logloss:0.12927
                                         validation 0-error:0.02851
[33]
validation 1-logloss:0.15500
                                 validation 1-error:0.03898
        validation 0-logloss:0.12641
                                         validation 0-error:0.02738
validation_1-logloss:0.15441
                                 validation 1-error:0.03898
        validation_0-logloss:0.12454
                                         validation 0-error:0.02813
[35]
validation_1-logloss:0.15273
                                 validation_1-error:0.03898
        validation_0-logloss:0.12209
                                         validation_0-error:0.02813
[36]
validation_1-logloss:0.15238
                                 validation_1-error:0.03898
        validation_0-logloss:0.12085
[37]
                                         validation_0-error:0.02813
validation_1-logloss:0.15147
                                 validation 1-error:0.03898
        validation_0-logloss:0.11906
[38]
                                         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
        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
        validation_0-logloss:0.11137
                                         validation_0-error:0.02701
[44]
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
        validation 0-logloss:0.10775
                                         validation 0-error:0.02626
validation 1-logloss:0.14637
                                 validation 1-error:0.03748
        validation 0-logloss:0.10673
                                         validation 0-error:0.02663
[49]
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
        validation_0-logloss:0.10447
                                         validation_0-error:0.02626
[51]
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
        validation_0-logloss:0.10301
[53]
                                         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
        validation_0-logloss:0.10129
[56]
                                         validation_0-error:0.02513
validation_1-logloss:0.14504
                                 validation 1-error:0.03748
        validation 0-logloss:0.10070
                                         validation 0-error:0.02476
[57]
validation 1-logloss:0.14504
                                 validation 1-error:0.03748
        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
        validation_0-logloss:0.09941
                                         validation_0-error:0.02476
[60]
validation_1-logloss:0.14489
                                 validation_1-error:0.03748
        validation_0-logloss:0.09876
[61]
                                         validation_0-error:0.02476
validation_1-logloss:0.14457
                                 validation 1-error:0.03748
        validation_0-logloss:0.09844
[62]
                                         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
        validation_0-logloss:0.09718
                                         validation 0-error:0.02438
validation 1-logloss:0.14475
                                 validation 1-error:0.03748
        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
validation_1-logloss:0.14385
                                 validation_1-error:0.03748
        validation_0-logloss:0.09482
                                         validation_0-error:0.02401
[68]
validation_1-logloss:0.14378
                                 validation_1-error:0.03748
[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
validation_1-logloss:0.14418
                                 validation_1-error:0.03748
[71]
        validation_0-logloss:0.09266
                                         validation_0-error:0.02326
validation_1-logloss:0.14388
                                 validation 1-error:0.03748
        validation 0-logloss:0.09238
                                         validation 0-error:0.02326
validation 1-logloss:0.14388
                                 validation 1-error:0.03748
        validation 0-logloss:0.09173
                                         validation 0-error:0.02326
[73]
validation_1-logloss:0.14405
                                 validation 1-error:0.03898
        validation_0-logloss:0.09108
                                         validation_0-error:0.02326
[74]
validation_1-logloss:0.14392
                                 validation 1-error:0.03898
        validation_0-logloss:0.08988
                                         validation_0-error:0.02326
[75]
validation_1-logloss:0.14361
                                 validation_1-error:0.04048
[76]
        validation_0-logloss:0.08952
                                         validation_0-error:0.02326
validation_1-logloss:0.14385
                                 validation 1-error:0.04048
        validation_0-logloss:0.08895
[77]
                                         validation_0-error:0.02326
validation_1-logloss:0.14316
                                 validation_1-error:0.04048
[78]
        validation_0-logloss:0.08818
                                         validation_0-error:0.02288
validation_1-logloss:0.14352
                                 validation_1-error:0.04048
```

```
[79]
        validation_0-logloss:0.08769
                                         validation_0-error:0.02288
validation_1-logloss:0.14394
                                validation_1-error:0.03898
        validation_0-logloss:0.08666
[80]
                                         validation_0-error:0.02326
validation_1-logloss:0.14422
                                validation 1-error:0.03898
        validation 0-logloss:0.08623
                                         validation 0-error:0.02326
[81]
validation 1-logloss:0.14402
                                validation 1-error:0.03898
        validation 0-logloss:0.08586
                                         validation_0-error:0.02326
validation_1-logloss:0.14414
                                 validation 1-error:0.03898
        validation_0-logloss:0.08513
                                         validation 0-error:0.02288
[83]
validation_1-logloss:0.14399
                                validation_1-error:0.03898
        validation_0-logloss:0.08464
[84]
                                         validation_0-error:0.02288
validation_1-logloss:0.14392
                                validation_1-error:0.03598
        validation_0-logloss:0.08368
[85]
                                         validation_0-error:0.02288
validation_1-logloss:0.14380
                                validation_1-error:0.03748
        validation_0-logloss:0.08347
[86]
                                         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
        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
        validation_0-logloss:0.55172
                                         validation_0-error:0.04539
validation_1-logloss:0.55447
                                validation_1-error:0.05697
        validation_0-logloss:0.49874
                                         validation_0-error:0.04651
[2]
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
        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
        validation_0-logloss:0.35419
                                         validation_0-error:0.04501
[6]
validation_1-logloss:0.36148
                                validation_1-error:0.05247
        validation_0-logloss:0.32923
                                         validation_0-error:0.04464
[7]
validation_1-logloss:0.33708
                                validation_1-error:0.05097
        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
        validation_0-logloss:0.25348
                                         validation_0-error:0.04314
[11]
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
Γ137
        validation_0-logloss:0.22768
                                         validation 0-error:0.03939
validation 1-logloss:0.23638
                                 validation 1-error:0.04498
                                         validation_0-error:0.03901
[14]
        validation_0-logloss:0.21693
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
        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
Г197
        validation 0-logloss:0.17621
                                         validation 0-error:0.03713
validation 1-logloss:0.19145
                                 validation 1-error:0.04198
        validation 0-logloss:0.17032
                                         validation 0-error:0.03676
[20]
validation_1-logloss:0.18670
                                 validation_1-error:0.04348
        validation_0-logloss:0.16521
                                         validation 0-error:0.03713
[21]
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
        validation_0-logloss:0.15673
[23]
                                         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
        validation 0-logloss:0.14393
[27]
                                         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
        validation_0-logloss:0.13945
                                         validation 0-error:0.03226
[29]
validation_1-logloss:0.15940
                                 validation_1-error:0.04048
        validation_0-logloss:0.13661
[30]
                                         validation_0-error:0.03151
validation_1-logloss:0.15794
                                 validation_1-error:0.03898
        validation_0-logloss:0.13512
                                         validation_0-error:0.03151
[31]
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
        validation_0-logloss:0.12837
                                         validation_0-error:0.03038
[35]
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
                                         validation_0-error:0.03001
[38]
        validation_0-logloss:0.12469
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
        validation_0-logloss:0.12273
                                         validation_0-error:0.03001
[40]
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
Γ431
        validation 0-logloss:0.11957
                                         validation 0-error:0.02963
validation 1-logloss:0.14834
                                 validation 1-error:0.03598
        validation 0-logloss:0.11822
                                         validation 0-error:0.02963
[44]
validation_1-logloss:0.14805
                                 validation 1-error:0.03598
        validation 0-logloss:0.11642
                                         validation 0-error:0.02963
[45]
validation_1-logloss:0.14742
                                 validation_1-error:0.03598
        validation_0-logloss:0.11565
                                         validation_0-error:0.02963
[46]
validation_1-logloss:0.14733
                                 validation_1-error:0.03598
        validation_0-logloss:0.11481
[47]
                                         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
        validation 0-logloss:0.11034
[51]
                                         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
        validation_0-logloss:0.10872
[53]
                                         validation 0-error:0.02888
validation_1-logloss:0.14662
                                 validation_1-error:0.03448
        validation_0-logloss:0.10799
[54]
                                         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
        validation_0-logloss:0.10187
                                         validation_0-error:0.02701
[64]
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-error:0.03598
validation 1-logloss:0.14655
        validation 0-logloss:0.09961
[68]
                                         validation 0-error:0.02626
validation_1-logloss:0.14649
                                 validation_1-error:0.03748
        validation_0-logloss:0.09871
                                         validation 0-error:0.02663
[69]
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
        validation_0-logloss:0.09735
[71]
                                         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
        validation_0-logloss:0.09660
[73]
                                         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
        validation 0-logloss:0.09507
[75]
                                         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
        validation_0-logloss:0.09387
[77]
                                         validation 0-error:0.02663
validation_1-logloss:0.14811
                                 validation_1-error:0.03598
        validation_0-logloss:0.09365
[78]
                                         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
        validation_0-logloss:0.09087
                                         validation_0-error:0.02663
[82]
validation_1-logloss:0.14823
                                validation_1-error:0.03448
        validation_0-logloss:0.09051
                                         validation_0-error:0.02663
[83]
validation 1-logloss:0.14850
                                validation 1-error:0.03448
        validation_0-logloss:0.09008
                                         validation 0-error:0.02663
[84]
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
        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
        validation 0-logloss:0.08805
                                        validation 0-error:0.02588
validation 1-logloss:0.14869
                                validation 1-error:0.03598
        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
        validation_0-logloss:0.55295
                                         validation_0-error:0.05326
validation_1-logloss:0.55393
                                validation_1-error:0.05247
        validation_0-logloss:0.50032
                                         validation_0-error:0.05326
validation_1-logloss:0.50182
                                validation_1-error:0.05097
        validation_0-logloss:0.45516
                                         validation_0-error:0.05064
[3]
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
        validation 0-logloss:0.38168
                                         validation 0-error:0.04651
validation 1-logloss:0.38565
                                validation 1-error:0.05247
        validation 0-logloss:0.35259
                                         validation 0-error:0.04276
validation_1-logloss:0.35754
                                validation 1-error:0.05547
        validation_0-logloss:0.32671
                                         validation_0-error:0.04051
[7]
validation_1-logloss:0.33316
                                validation 1-error:0.05697
        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
        validation_0-logloss:0.22547
                                         validation_0-error:0.03413
[13]
validation_1-logloss:0.23799
                                 validation 1-error:0.04498
        validation 0-logloss:0.21454
                                         validation 0-error:0.03413
Γ147
validation 1-logloss:0.22846
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.18903
                                         validation_0-error:0.03113
[17]
validation_1-logloss:0.20558
                                 validation_1-error:0.04498
        validation_0-logloss:0.18243
                                         validation_0-error:0.03113
[18]
validation_1-logloss:0.19914
                                 validation 1-error:0.04498
        validation_0-logloss:0.17634
[19]
                                         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
        validation 0-logloss:0.16126
                                         validation 0-error:0.02963
validation 1-logloss:0.18161
                                 validation 1-error:0.04498
        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
        validation_0-logloss:0.15038
                                         validation_0-error:0.02851
[25]
validation_1-logloss:0.17350
                                 validation_1-error:0.04498
        validation_0-logloss:0.14739
[26]
                                         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
        validation 0-logloss:0.13936
                                         validation 0-error:0.02813
validation 1-logloss:0.16522
                                 validation 1-error:0.04348
        validation 0-logloss:0.13727
                                         validation 0-error:0.02776
[30]
validation_1-logloss:0.16309
                                 validation 1-error:0.04348
        validation_0-logloss:0.13512
                                         validation_0-error:0.02701
[31]
validation_1-logloss:0.16072
                                 validation 1-error:0.04348
        validation_0-logloss:0.13202
                                         validation_0-error:0.02701
[32]
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
        validation_0-logloss:0.12746
[34]
                                         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
        validation_0-logloss:0.12196
[37]
                                         validation_0-error:0.02663
validation_1-logloss:0.15551
                                 validation 1-error:0.04198
        validation 0-logloss:0.12040
                                         validation 0-error:0.02663
[38]
validation 1-logloss:0.15364
                                 validation 1-error:0.04198
        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
        validation_0-logloss:0.11719
                                         validation_0-error:0.02701
[41]
validation_1-logloss:0.15309
                                 validation_1-error:0.03748
        validation_0-logloss:0.11626
                                         validation_0-error:0.02663
[42]
validation_1-logloss:0.15199
                                 validation 1-error:0.03748
        validation_0-logloss:0.11494
[43]
                                         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
        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-error:0.03748
validation_1-logloss:0.14772
[52]
        validation_0-logloss:0.10761
                                         validation_0-error:0.02738
validation 1-logloss:0.14780
                                 validation 1-error:0.03748
        validation 0-logloss:0.10703
                                         validation 0-error:0.02738
validation 1-logloss:0.14710
                                 validation 1-error:0.03748
        validation 0-logloss:0.10585
                                         validation 0-error:0.02738
[54]
validation_1-logloss:0.14762
                                 validation 1-error:0.03748
        validation_0-logloss:0.10506
                                         validation_0-error:0.02776
[55]
validation_1-logloss:0.14700
                                 validation 1-error:0.03748
        validation_0-logloss:0.10431
                                         validation_0-error:0.02776
[56]
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
        validation_0-logloss:0.10358
[58]
                                         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
        validation_0-logloss:0.10135
                                         validation_0-error:0.02738
[61]
validation_1-logloss:0.14770
                                validation 1-error:0.03748
        validation 0-logloss:0.10090
                                         validation 0-error:0.02738
Γ62]
validation 1-logloss:0.14780
                                validation 1-error:0.03748
        validation 0-logloss:0.10043
                                         validation_0-error:0.02738
validation_1-logloss:0.14818
                                 validation 1-error:0.03748
        validation_0-logloss:0.09935
                                         validation 0-error:0.02738
[64]
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
        validation 0-logloss:0.09764
[67]
                                         validation 0-error:0.02738
validation_1-logloss:0.14865
                                validation_1-error:0.03598
        validation 0-logloss:0.09714
                                         validation_0-error:0.02738
[68]
validation_1-logloss:0.14867
                                validation_1-error:0.03748
        validation_0-logloss:0.09668
[69]
                                         validation_0-error:0.02701
validation_1-logloss:0.14907
                                validation_1-error:0.03598
        validation_0-logloss:0.09621
[70]
                                         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
        validation_0-logloss:0.09483
                                         validation_0-error:0.02701
[73]
validation 1-logloss:0.14866
                                validation 1-error:0.03598
        validation 0-logloss:0.09424
Γ741
                                         validation 0-error:0.02701
validation 1-logloss:0.14765
                                validation 1-error:0.03598
        validation_0-logloss:0.09373
                                         validation 0-error:0.02701
[75]
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
        validation_0-logloss:0.09271
                                         validation_0-error:0.02701
[77]
validation_1-logloss:0.14694
                                validation_1-error:0.03748
        validation_0-logloss:0.09236
                                         validation_0-error:0.02663
[78]
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
validation 1-logloss:0.14708
                                 validation 1-error:0.03748
[83]
        validation_0-logloss:0.08985
                                         validation 0-error:0.02663
validation 1-logloss:0.14694
                                 validation_1-error:0.03748
[84]
        validation_0-logloss:0.08943
                                         validation_0-error:0.02626
validation 1-logloss:0.14642
                                 validation 1-error:0.03898
[85]
        validation_0-logloss:0.08896
                                         validation_0-error:0.02626
validation_1-logloss:0.14641
                                 validation_1-error:0.03748
[86]
        validation_0-logloss:0.08867
                                         validation_0-error:0.02626
validation_1-logloss:0.14623
                                 validation_1-error:0.03748
        validation_0-logloss:0.08832
                                         validation_0-error:0.02626
[87]
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
[0]
        validation 0-logloss:0.61545
                                         validation 0-error:0.04989
                                 validation 1-error:0.07046
validation 1-logloss:0.61817
        validation 0-logloss:0.55171
[1]
                                         validation 0-error:0.04876
validation_1-logloss:0.55672
                                 validation_1-error:0.07046
        validation_0-logloss:0.49845
                                         validation 0-error:0.04839
validation_1-logloss:0.50531
                                 validation_1-error:0.07196
        validation_0-logloss:0.45329
                                         validation_0-error:0.04764
[3]
validation_1-logloss:0.46160
                                 validation_1-error:0.07196
        validation_0-logloss:0.41480
[4]
                                         validation_0-error:0.04839
validation_1-logloss:0.42355
                                 validation 1-error:0.07196
        validation_0-logloss:0.38197
                                         validation_0-error:0.04726
validation_1-logloss:0.39193
                                 validation_1-error:0.07046
        validation_0-logloss:0.35303
                                         validation_0-error:0.04689
validation_1-logloss:0.36511
                                 validation_1-error:0.07046
        validation_0-logloss:0.32795
                                         validation_0-error:0.04614
[7]
validation 1-logloss:0.34127
                                 validation 1-error:0.06897
        validation 0-logloss:0.30618
[8]
                                         validation 0-error:0.04239
validation 1-logloss:0.32055
                                 validation 1-error:0.05997
        validation_0-logloss:0.28742
                                         validation 0-error:0.04239
validation_1-logloss:0.30389
                                 validation_1-error:0.06897
        validation_0-logloss:0.26975
Γ107
                                         validation 0-error:0.04351
validation_1-logloss:0.28606
                                 validation_1-error:0.06147
        validation_0-logloss:0.25427
                                         validation_0-error:0.04501
[11]
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
        validation_0-logloss:0.19957
                                         validation_0-error:0.03788
[16]
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
Г18<sub>]</sub>
        validation_0-logloss:0.18446
                                         validation 0-error:0.03676
validation 1-logloss:0.20411
                                 validation 1-error:0.04947
                                         validation_0-error:0.03638
        validation_0-logloss:0.17807
[19]
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
        validation_0-logloss:0.16771
                                         validation_0-error:0.03601
[21]
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
Γ241
        validation 0-logloss:0.15471
                                         validation 0-error:0.03601
validation 1-logloss:0.18294
                                 validation 1-error:0.04798
        validation 0-logloss:0.15054
                                         validation 0-error:0.03526
[25]
validation_1-logloss:0.18051
                                 validation 1-error:0.04798
        validation_0-logloss:0.14689
                                         validation_0-error:0.03488
[26]
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
        validation_0-logloss:0.14211
[28]
                                         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
        validation_0-logloss:0.13725
[30]
                                         validation_0-error:0.03226
validation_1-logloss:0.17107
                                 validation_1-error:0.04498
[31]
        validation_0-logloss:0.13425
                                         validation_0-error:0.03151
validation 1-logloss:0.16994
                                 validation 1-error:0.04348
        validation 0-logloss:0.13271
[32]
                                         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
        validation_0-logloss:0.12860
                                         validation 0-error:0.03188
[34]
validation_1-logloss:0.16588
                                 validation_1-error:0.04198
        validation_0-logloss:0.12625
                                         validation_0-error:0.03151
[35]
validation_1-logloss:0.16437
                                 validation_1-error:0.04198
        validation_0-logloss:0.12462
                                         validation_0-error:0.03151
[36]
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
        validation 0-logloss:0.11848
                                         validation 0-error:0.03113
[41]
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
                                         validation_0-error:0.03076
[43]
        validation_0-logloss:0.11665
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
        validation_0-logloss:0.11355
                                         validation_0-error:0.03001
[45]
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
Γ48]
        validation 0-logloss:0.10983
                                         validation 0-error:0.02926
validation 1-logloss:0.16088
                                 validation 1-error:0.04348
        validation 0-logloss:0.10895
                                         validation 0-error:0.02926
[49]
validation_1-logloss:0.16081
                                 validation 1-error:0.04348
        validation_0-logloss:0.10814
                                         validation 0-error:0.02926
[50]
validation_1-logloss:0.16025
                                 validation_1-error:0.04348
        validation_0-logloss:0.10761
                                         validation_0-error:0.02926
[51]
validation_1-logloss:0.15997
                                 validation_1-error:0.04498
        validation_0-logloss:0.10693
[52]
                                         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
validation_1-logloss:0.16084
                                 validation_1-error:0.04798
        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
validation 1-logloss:0.16105
                                 validation 1-error:0.04498
        validation 0-logloss:0.10366
[56]
                                         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
validation_1-logloss:0.16175
                                 validation_1-error:0.04648
        validation_0-logloss:0.10293
                                         validation 0-error:0.02776
[58]
validation_1-logloss:0.16102
                                 validation_1-error:0.04648
        validation_0-logloss:0.10228
[59]
                                         validation_0-error:0.02813
validation_1-logloss:0.16142
                                 validation_1-error:0.04648
        validation_0-logloss:0.10114
                                         validation_0-error:0.02738
[60]
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
        validation_0-logloss:0.09903
                                         validation_0-error:0.02663
[63]
validation_1-logloss:0.16182
                                validation_1-error:0.04648
        validation_0-logloss:0.09867
                                         validation_0-error:0.02663
[64]
validation 1-logloss:0.16213
                                validation 1-error:0.04648
        validation_0-logloss:0.09797
                                         validation 0-error:0.02626
[65]
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
        validation_0-logloss:0.09580
                                         validation_0-error:0.02626
[68]
validation_1-logloss:0.16131
                                validation_1-error:0.04498
        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
        validation 0-logloss:0.09372
[73]
                                         validation 0-error:0.02551
validation_1-logloss:0.16052
                                validation_1-error:0.04498
        validation_0-logloss:0.09349
                                         validation_0-error:0.02551
[74]
validation_1-logloss:0.16047
                                validation_1-error:0.04648
        validation_0-logloss:0.09288
[75]
                                         validation_0-error:0.02513
validation_1-logloss:0.16090
                                validation_1-error:0.04498
        validation_0-logloss:0.09236
[76]
                                         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
        validation_0-logloss:0.09059
[80]
                                         validation 0-error:0.02476
validation 1-logloss:0.15965
                                validation 1-error:0.04198
        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
validation_1-logloss:0.15950
                                 validation_1-error:0.04198
        validation_0-logloss:0.08909
                                         validation_0-error:0.02438
[84]
validation_1-logloss:0.15972
                                 validation 1-error:0.04198
        validation 0-logloss:0.08888
                                         validation 0-error:0.02438
[85]
validation 1-logloss:0.15975
                                 validation 1-error:0.04198
        validation 0-logloss:0.08843
                                         validation 0-error:0.02476
validation_1-logloss:0.15951
                                 validation 1-error:0.04198
[87]
        validation_0-logloss:0.08817
                                         validation 0-error:0.02476
                                 validation_1-error:0.04348
validation_1-logloss:0.15936
        validation_0-logloss:0.08793
                                         validation_0-error:0.02438
[88]
validation_1-logloss:0.15930
                                 validation_1-error:0.04348
        validation_0-logloss:0.08722
                                         validation_0-error:0.02401
[89]
validation_1-logloss:0.15951
                                 validation_1-error:0.04498
        validation_0-logloss:0.61582
[0]
                                         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
        validation_0-logloss:0.45437
                                         validation 0-error:0.04689
validation 1-logloss:0.46189
                                 validation 1-error:0.06597
        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
        validation_0-logloss:0.35538
                                         validation_0-error:0.04539
[6]
validation_1-logloss:0.36566
                                 validation_1-error:0.06297
        validation_0-logloss:0.33069
[7]
                                         validation_0-error:0.04501
validation_1-logloss:0.34228
                                 validation_1-error:0.06297
        validation_0-logloss:0.30717
                                         validation_0-error:0.04501
[8]
                                 validation_1-error:0.06297
validation_1-logloss:0.31941
        validation_0-logloss:0.28698
[9]
                                         validation_0-error:0.04426
validation_1-logloss:0.29997
                                 validation 1-error:0.06297
        validation 0-logloss:0.26928
                                         validation 0-error:0.04276
validation 1-logloss:0.28309
                                 validation 1-error:0.06147
        validation 0-logloss:0.25326
                                         validation 0-error:0.03901
[11]
validation_1-logloss:0.26720
                                 validation 1-error:0.05847
        validation_0-logloss:0.23927
                                         validation_0-error:0.03751
[12]
validation_1-logloss:0.25365
                                 validation 1-error:0.05247
        validation_0-logloss:0.22708
                                         validation_0-error:0.03751
[13]
validation_1-logloss:0.24224
                                 validation_1-error:0.05397
[14]
        validation_0-logloss:0.21613
                                         validation_0-error:0.03751
validation_1-logloss:0.23222
                                 validation 1-error:0.05397
        validation_0-logloss:0.20626
[15]
                                         validation_0-error:0.03638
validation_1-logloss:0.22340
                                 validation_1-error:0.05397
[16]
        validation_0-logloss:0.19709
                                         validation_0-error:0.03638
validation_1-logloss:0.21558
                                 validation_1-error:0.05547
```

```
[17]
        validation_0-logloss:0.18958
                                         validation_0-error:0.03601
validation_1-logloss:0.20893
                                 validation_1-error:0.05247
        validation_0-logloss:0.18252
                                         validation_0-error:0.03451
[18]
validation_1-logloss:0.20247
                                 validation 1-error:0.05097
        validation 0-logloss:0.17668
                                         validation 0-error:0.03413
Г197
validation 1-logloss:0.19726
                                 validation 1-error:0.04798
        validation 0-logloss:0.17124
                                         validation 0-error:0.03451
validation_1-logloss:0.19252
                                 validation 1-error:0.04798
        validation_0-logloss:0.16594
                                         validation 0-error:0.03413
[21]
validation_1-logloss:0.18831
                                 validation_1-error:0.04798
[22]
        validation_0-logloss:0.16169
                                         validation_0-error:0.03338
validation_1-logloss:0.18463
                                 validation_1-error:0.04798
        validation_0-logloss:0.15795
                                         validation_0-error:0.03301
[23]
validation_1-logloss:0.18200
                                 validation 1-error:0.04947
        validation_0-logloss:0.15417
[24]
                                         validation_0-error:0.03301
validation_1-logloss:0.17755
                                 validation_1-error:0.04798
[25]
        validation_0-logloss:0.15071
                                         validation_0-error:0.03263
validation_1-logloss:0.17556
                                 validation_1-error:0.04798
[26]
        validation_0-logloss:0.14747
                                         validation_0-error:0.03188
validation 1-logloss:0.17204
                                 validation 1-error:0.04798
        validation_0-logloss:0.14470
                                         validation 0-error:0.03076
validation 1-logloss:0.16952
                                 validation 1-error:0.04798
        validation_0-logloss:0.14194
                                         validation_0-error:0.03113
validation_1-logloss:0.16635
                                 validation 1-error:0.04798
[29]
        validation_0-logloss:0.13873
                                         validation_0-error:0.03076
validation_1-logloss:0.16463
                                 validation_1-error:0.04798
[30]
        validation_0-logloss:0.13655
                                         validation_0-error:0.03076
validation_1-logloss:0.16275
                                 validation_1-error:0.04798
[31]
        validation_0-logloss:0.13368
                                         validation_0-error:0.03076
validation_1-logloss:0.16142
                                 validation_1-error:0.04798
[32]
        validation_0-logloss:0.13139
                                         validation_0-error:0.03038
validation_1-logloss:0.15977
                                 validation_1-error:0.04648
[33]
        validation_0-logloss:0.12956
                                         validation_0-error:0.03001
validation 1-logloss:0.15889
                                 validation 1-error:0.04648
        validation 0-logloss:0.12808
                                         validation 0-error:0.03001
validation 1-logloss:0.15880
                                 validation 1-error:0.04648
        validation 0-logloss:0.12644
                                         validation 0-error:0.03001
[35]
validation_1-logloss:0.15686
                                 validation 1-error:0.04648
        validation_0-logloss:0.12481
                                         validation_0-error:0.02926
[36]
validation_1-logloss:0.15544
                                 validation 1-error:0.04498
        validation_0-logloss:0.12374
                                         validation_0-error:0.02926
[37]
validation_1-logloss:0.15513
                                 validation_1-error:0.04648
[38]
        validation_0-logloss:0.12191
                                         validation_0-error:0.02888
validation_1-logloss:0.15450
                                 validation 1-error:0.04498
        validation_0-logloss:0.12061
[39]
                                         validation_0-error:0.02851
validation_1-logloss:0.15375
                                 validation_1-error:0.04348
[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
        validation_0-logloss:0.11616
[42]
                                         validation_0-error:0.02851
validation_1-logloss:0.15325
                                 validation 1-error:0.04348
        validation 0-logloss:0.11539
                                         validation 0-error:0.02851
Γ431
validation 1-logloss:0.15381
                                 validation 1-error:0.04498
        validation 0-logloss:0.11381
                                         validation 0-error:0.02813
validation_1-logloss:0.15325
                                 validation 1-error:0.04348
[45]
        validation_0-logloss:0.11299
                                         validation 0-error:0.02813
validation_1-logloss:0.15316
                                 validation_1-error:0.04498
        validation_0-logloss:0.11233
                                         validation_0-error:0.02776
[46]
validation_1-logloss:0.15310
                                 validation_1-error:0.04498
        validation_0-logloss:0.11137
[47]
                                         validation_0-error:0.02776
validation_1-logloss:0.15354
                                 validation 1-error:0.04498
        validation_0-logloss:0.11046
[48]
                                         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
validation_1-logloss:0.15295
                                 validation_1-error:0.04498
[50]
        validation 0-logloss:0.10767
                                         validation_0-error:0.02738
validation 1-logloss:0.15349
                                 validation 1-error:0.04498
        validation 0-logloss:0.10705
                                         validation 0-error:0.02738
validation 1-logloss:0.15326
                                 validation 1-error:0.04498
[52]
        validation_0-logloss:0.10666
                                         validation_0-error:0.02738
validation_1-logloss:0.15358
                                 validation_1-error:0.04498
[53]
        validation_0-logloss:0.10577
                                         validation_0-error:0.02738
validation_1-logloss:0.15371
                                 validation_1-error:0.04498
        validation_0-logloss:0.10462
                                         validation_0-error:0.02663
[54]
validation_1-logloss:0.15440
                                 validation_1-error:0.04348
[55]
        validation_0-logloss:0.10396
                                         validation_0-error:0.02701
validation_1-logloss:0.15412
                                 validation_1-error:0.04348
[56]
        validation_0-logloss:0.10323
                                         validation_0-error:0.02663
validation_1-logloss:0.15455
                                 validation_1-error:0.04348
[57]
        validation_0-logloss:0.10224
                                         validation_0-error:0.02701
validation 1-logloss:0.15417
                                 validation 1-error:0.04348
        validation 0-logloss:0.10204
                                         validation 0-error:0.02663
validation 1-logloss:0.15435
                                 validation 1-error:0.04198
        validation 0-logloss:0.10147
                                         validation 0-error:0.02701
[59]
validation_1-logloss:0.15435
                                 validation 1-error:0.04348
[60]
        validation_0-logloss:0.10080
                                         validation_0-error:0.02626
validation_1-logloss:0.15421
                                 validation 1-error:0.04348
        validation_0-logloss:0.10037
                                         validation_0-error:0.02663
[61]
validation_1-logloss:0.15423
                                 validation_1-error:0.04648
[62]
        validation_0-logloss:0.09975
                                         validation_0-error:0.02626
validation_1-logloss:0.15423
                                 validation 1-error:0.04648
        validation_0-logloss:0.09906
[63]
                                         validation_0-error:0.02626
validation_1-logloss:0.15441
                                 validation_1-error:0.04648
[64]
        validation_0-logloss:0.09853
                                         validation_0-error:0.02626
validation_1-logloss:0.15389
                                 validation_1-error:0.04498
```

```
[65]
        validation_0-logloss:0.09744
                                         validation_0-error:0.02626
validation_1-logloss:0.15401
                                 validation_1-error:0.04348
        validation_0-logloss:0.09691
[66]
                                         validation_0-error:0.02663
validation_1-logloss:0.15388
                                 validation 1-error:0.04498
        validation 0-logloss:0.09624
                                         validation 0-error:0.02626
[67]
validation 1-logloss:0.15323
                                 validation 1-error:0.04348
        validation 0-logloss:0.09565
                                         validation 0-error:0.02626
validation_1-logloss:0.15304
                                 validation 1-error:0.04198
[69]
        validation_0-logloss:0.09527
                                         validation 0-error:0.02626
validation_1-logloss:0.15303
                                 validation_1-error:0.04198
        validation_0-logloss:0.09464
                                         validation_0-error:0.02663
[70]
validation_1-logloss:0.15263
                                 validation_1-error:0.04048
        validation_0-logloss:0.09430
                                         validation_0-error:0.02626
[71]
validation_1-logloss:0.15253
                                 validation 1-error:0.04048
        validation_0-logloss:0.09326
[72]
                                         validation_0-error:0.02663
validation_1-logloss:0.15278
                                 validation_1-error:0.04048
[73]
        validation_0-logloss:0.09259
                                         validation_0-error:0.02626
validation_1-logloss:0.15272
                                 validation_1-error:0.04048
[74]
        validation_0-logloss:0.09222
                                         validation_0-error:0.02626
validation 1-logloss:0.15290
                                 validation 1-error:0.04048
        validation 0-logloss:0.09165
                                         validation 0-error:0.02626
validation 1-logloss:0.15310
                                 validation 1-error:0.04048
[76]
        validation_0-logloss:0.09123
                                         validation_0-error:0.02663
validation_1-logloss:0.15317
                                 validation 1-error:0.04048
[77]
        validation_0-logloss:0.09090
                                         validation_0-error:0.02663
validation_1-logloss:0.15299
                                 validation_1-error:0.04048
        validation_0-logloss:0.09056
                                         validation_0-error:0.02626
[78]
validation_1-logloss:0.15266
                                 validation_1-error:0.04048
[79]
        validation_0-logloss:0.09006
                                         validation_0-error:0.02588
validation_1-logloss:0.15240
                                 validation_1-error:0.03898
[80]
        validation_0-logloss:0.08953
                                         validation_0-error:0.02588
validation_1-logloss:0.15267
                                 validation_1-error:0.03898
[81]
        validation_0-logloss:0.08819
                                         validation_0-error:0.02626
validation 1-logloss:0.15286
                                 validation 1-error:0.03898
        validation 0-logloss:0.08804
                                         validation 0-error:0.02626
validation 1-logloss:0.15315
                                 validation 1-error:0.03898
        validation 0-logloss:0.08771
                                         validation 0-error:0.02626
[83]
validation_1-logloss:0.15341
                                 validation 1-error:0.03898
        validation_0-logloss:0.08755
                                         validation_0-error:0.02626
[84]
validation_1-logloss:0.15348
                                 validation 1-error:0.03898
        validation_0-logloss:0.08721
                                         validation_0-error:0.02551
[85]
validation_1-logloss:0.15331
                                 validation_1-error:0.03898
[86]
        validation_0-logloss:0.08615
                                         validation_0-error:0.02513
validation_1-logloss:0.15295
                                 validation 1-error:0.03898
        validation_0-logloss:0.08591
[87]
                                         validation_0-error:0.02513
validation_1-logloss:0.15333
                                 validation_1-error:0.03898
[88]
        validation_0-logloss:0.08554
                                         validation_0-error:0.02513
validation_1-logloss:0.15361
                                 validation_1-error:0.03898
```

```
[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
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:0.61605
                                        validation_0-error:0.04801
validation_1-logloss:0.61867
                                validation_1-error:0.06447
        validation_0-logloss:0.55288
                                        validation_0-error:0.04726
[1]
validation_1-logloss:0.55768
                                validation 1-error:0.06147
        validation 0-logloss:0.50018
                                        validation 0-error:0.04764
validation 1-logloss:0.50634
                                validation 1-error:0.06297
        validation 0-logloss:0.45547
[3]
                                        validation 0-error:0.04726
validation_1-logloss:0.46285
                                validation_1-error:0.06147
        validation_0-logloss:0.41734
                                        validation_0-error:0.04726
validation_1-logloss:0.42669
                                validation_1-error:0.06147
        validation_0-logloss:0.38440
[5]
                                        validation_0-error:0.04764
validation_1-logloss:0.39375
                                validation_1-error:0.06297
        validation_0-logloss:0.35590
                                        validation_0-error:0.04726
validation_1-logloss:0.36561
                                validation 1-error:0.06297
        validation_0-logloss:0.33133
                                        validation_0-error:0.04689
validation_1-logloss:0.34297
                                validation_1-error:0.06147
        validation_0-logloss:0.30817
                                        validation_0-error:0.04726
validation_1-logloss:0.31959
                                validation_1-error:0.06297
        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
        validation_0-logloss:0.25376
                                         validation_0-error:0.04163
[11]
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
        validation_0-logloss:0.22691
                                        validation_0-error:0.04239
[13]
validation_1-logloss:0.24068
                                validation_1-error:0.05247
        validation_0-logloss:0.21621
                                        validation_0-error:0.03976
validation_1-logloss:0.23013
                                validation_1-error:0.04798
        validation_0-logloss:0.20645
                                        validation_0-error:0.03788
validation_1-logloss:0.22102
                                validation_1-error:0.04498
```

validation_0-error:0.03638

validation_0-logloss:0.19709

[16]

```
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
        validation_0-logloss:0.18306
                                         validation_0-error:0.03488
[18]
validation 1-logloss:0.19873
                                 validation 1-error:0.04348
        validation 0-logloss:0.17640
                                         validation 0-error:0.03151
[19]
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
        validation_0-logloss:0.15784
                                         validation_0-error:0.03038
[23]
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
[26]
        validation 0-logloss:0.14731
                                         validation 0-error:0.03001
validation 1-logloss:0.16930
                                 validation 1-error:0.03898
        validation 0-logloss:0.14433
[27]
                                         validation 0-error:0.02963
validation_1-logloss:0.16648
                                 validation_1-error:0.03898
        validation 0-logloss:0.14134
                                         validation_0-error:0.02926
[28]
validation_1-logloss:0.16449
                                 validation_1-error:0.03898
        validation_0-logloss:0.13885
                                         validation_0-error:0.02851
[29]
validation_1-logloss:0.16222
                                 validation_1-error:0.03898
        validation_0-logloss:0.13593
[30]
                                         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
        validation_0-logloss:0.13144
[32]
                                         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
        validation 0-logloss:0.12641
[34]
                                         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
        validation_0-logloss:0.12209
[36]
                                         validation 0-error:0.02813
validation_1-logloss:0.15238
                                 validation_1-error:0.03898
        validation_0-logloss:0.12085
                                         validation_0-error:0.02813
[37]
validation_1-logloss:0.15147
                                 validation_1-error:0.03898
        validation_0-logloss:0.11906
                                         validation_0-error:0.02888
[38]
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
        validation_0-logloss:0.11470
                                         validation_0-error:0.02738
[41]
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
        validation 0-logloss:0.11282
                                         validation 0-error:0.02701
[43]
validation 1-logloss:0.14725
                                 validation 1-error:0.03448
Γ441
        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
        validation_0-logloss:0.10877
                                         validation_0-error:0.02663
[47]
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-error:0.03748
validation 1-logloss:0.14635
        validation 0-logloss:0.10447
[51]
                                         validation 0-error:0.02626
validation_1-logloss:0.14574
                                 validation_1-error:0.03748
        validation_0-logloss:0.10403
                                         validation_0-error:0.02588
[52]
validation_1-logloss:0.14595
                                 validation_1-error:0.03748
        validation_0-logloss:0.10301
                                         validation_0-error:0.02588
[53]
validation_1-logloss:0.14545
                                 validation_1-error:0.03898
        validation_0-logloss:0.10225
[54]
                                         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
        validation_0-logloss:0.10129
[56]
                                         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
        validation 0-logloss:0.10005
[58]
                                         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
        validation_0-logloss:0.09941
[60]
                                         validation_0-error:0.02476
validation_1-logloss:0.14489
                                 validation_1-error:0.03748
        validation_0-logloss:0.09876
                                         validation_0-error:0.02476
[61]
validation_1-logloss:0.14457
                                 validation_1-error:0.03748
        validation_0-logloss:0.09844
                                         validation_0-error:0.02513
[62]
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
        validation_0-logloss:0.09610
                                         validation_0-error:0.02363
[66]
validation 1-logloss:0.14425
                                 validation 1-error:0.03748
[67]
        validation_0-logloss:0.09566
                                         validation 0-error:0.02363
validation 1-logloss:0.14385
                                 validation_1-error:0.03748
[68]
        validation_0-logloss:0.09482
                                         validation_0-error:0.02401
validation 1-logloss:0.14378
                                 validation 1-error:0.03748
[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
validation_1-logloss:0.14418
                                 validation_1-error:0.03748
        validation_0-logloss:0.09266
                                         validation_0-error:0.02326
[71]
validation_1-logloss:0.14388
                                 validation_1-error:0.03748
[72]
        validation_0-logloss:0.09238
                                         validation_0-error:0.02326
validation_1-logloss:0.14388
                                 validation_1-error:0.03748
[73]
        validation_0-logloss:0.09173
                                         validation_0-error:0.02326
validation_1-logloss:0.14405
                                 validation 1-error:0.03898
Γ741
        validation 0-logloss:0.09108
                                         validation 0-error:0.02326
                                 validation 1-error:0.03898
validation 1-logloss:0.14392
        validation 0-logloss:0.08988
[75]
                                         validation 0-error:0.02326
validation_1-logloss:0.14361
                                 validation_1-error:0.04048
        validation_0-logloss:0.08952
                                         validation_0-error:0.02326
[76]
validation_1-logloss:0.14385
                                 validation_1-error:0.04048
        validation_0-logloss:0.08895
                                         validation_0-error:0.02326
[77]
validation_1-logloss:0.14316
                                 validation_1-error:0.04048
        validation_0-logloss:0.08818
[78]
                                         validation_0-error:0.02288
validation_1-logloss:0.14352
                                 validation 1-error:0.04048
[79]
        validation_0-logloss:0.08769
                                         validation_0-error:0.02288
validation_1-logloss:0.14394
                                 validation_1-error:0.03898
        validation_0-logloss:0.08666
[80]
                                         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
        validation 0-logloss:0.08586
[82]
                                         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
        validation_0-logloss:0.08464
[84]
                                         validation_0-error:0.02288
validation_1-logloss:0.14392
                                 validation_1-error:0.03598
        validation_0-logloss:0.08368
                                         validation_0-error:0.02288
[85]
validation_1-logloss:0.14380
                                 validation_1-error:0.03748
        validation_0-logloss:0.08347
                                         validation_0-error:0.02288
[86]
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
[90]
        validation_0-logloss:0.08208
                                         validation_0-error:0.02251
validation 1-logloss:0.14332
                                 validation 1-error:0.03898
[91]
        validation 0-logloss:0.08185
                                         validation 0-error:0.02251
validation 1-logloss:0.14321
                                 validation 1-error:0.03748
[92]
        validation_0-logloss:0.08116
                                         validation_0-error:0.02251
validation 1-logloss:0.14337
                                 validation 1-error:0.03898
[93]
        validation_0-logloss:0.08057
                                         validation_0-error:0.02288
validation_1-logloss:0.14353
                                 validation_1-error:0.03898
[94]
        validation_0-logloss:0.08025
                                         validation_0-error:0.02288
validation_1-logloss:0.14350
                                 validation_1-error:0.03898
        validation_0-logloss:0.07954
                                         validation_0-error:0.02288
[95]
validation_1-logloss:0.14311
                                 validation_1-error:0.03748
[96]
        validation_0-logloss:0.07901
                                         validation_0-error:0.02251
validation_1-logloss:0.14292
                                 validation_1-error:0.03748
[97]
        validation_0-logloss:0.07823
                                         validation_0-error:0.02251
validation_1-logloss:0.14336
                                 validation 1-error:0.03598
[98]
        validation 0-logloss:0.07765
                                         validation 0-error:0.02251
validation 1-logloss:0.14355
                                 validation 1-error:0.03748
        validation 0-logloss:0.07739
[99]
                                         validation 0-error:0.02251
validation_1-logloss:0.14333
                                 validation_1-error:0.03748
        validation_0-logloss:0.07702
                                         validation 0-error:0.02251
[100]
validation_1-logloss:0.14340
                                 validation_1-error:0.03898
        validation_0-logloss:0.07674
                                         validation_0-error:0.02213
[101]
validation_1-logloss:0.14351
                                 validation_1-error:0.04198
        validation_0-logloss:0.07650
[102]
                                         validation_0-error:0.02213
validation_1-logloss:0.14369
                                 validation 1-error:0.04048
[103]
        validation_0-logloss:0.07621
                                         validation_0-error:0.02176
validation_1-logloss:0.14353
                                 validation_1-error:0.04198
        validation_0-logloss:0.07576
[104]
                                         validation_0-error:0.02176
validation_1-logloss:0.14353
                                 validation_1-error:0.04198
[105]
        validation_0-logloss:0.07551
                                         validation_0-error:0.02213
validation 1-logloss:0.14348
                                 validation 1-error:0.04198
        validation 0-logloss:0.07529
[106]
                                         validation 0-error:0.02213
validation 1-logloss:0.14343
                                 validation 1-error:0.04198
Γ107]
        validation_0-logloss:0.07512
                                         validation 0-error:0.02138
validation_1-logloss:0.14323
                                 validation_1-error:0.04198
        validation_0-logloss:0.07452
Γ1087
                                         validation 0-error:0.02213
validation_1-logloss:0.14327
                                 validation_1-error:0.04198
        validation_0-logloss:0.07435
[109]
                                         validation_0-error:0.02176
validation_1-logloss:0.14334
                                 validation_1-error:0.04198
        validation_0-logloss:0.07409
                                         validation_0-error:0.02213
[110]
validation_1-logloss:0.14350
                                 validation_1-error:0.04198
[111]
        validation_0-logloss:0.07371
                                         validation_0-error:0.02213
validation_1-logloss:0.14399
                                 validation_1-error:0.04198
[112]
        validation_0-logloss:0.07299
                                         validation_0-error:0.02176
```

```
validation_1-logloss:0.14374
                                 validation_1-error:0.04198
        validation_0-logloss:0.07244
                                         validation_0-error:0.02176
[113]
validation_1-logloss:0.14394
                                 validation_1-error:0.04198
[114]
        validation_0-logloss:0.07220
                                         validation_0-error:0.02063
validation 1-logloss:0.14366
                                 validation 1-error:0.04198
        validation 0-logloss:0.07161
                                         validation 0-error:0.02063
[115]
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
validation_1-logloss:0.14379
                                 validation_1-error:0.04048
        validation_0-logloss:0.07109
                                         validation_0-error:0.02063
[118]
validation_1-logloss:0.14388
                                 validation_1-error:0.04048
        validation_0-logloss:0.07040
                                         validation_0-error:0.02025
[119]
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
        validation_0-logloss:0.55172
                                         validation_0-error:0.04539
[1]
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
        validation 0-logloss:0.45368
                                         validation 0-error:0.04539
[3]
validation_1-logloss:0.45917
                                 validation_1-error:0.05697
        validation_0-logloss:0.41537
                                         validation_0-error:0.04539
validation_1-logloss:0.42147
                                 validation_1-error:0.05097
        validation_0-logloss:0.38260
                                         validation_0-error:0.04501
[5]
validation_1-logloss:0.38868
                                 validation_1-error:0.05397
        validation_0-logloss:0.35419
[6]
                                         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
        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
        validation 0-logloss:0.26873
[10]
                                         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
Γ12]
        validation_0-logloss:0.23986
                                         validation_0-error:0.04201
validation_1-logloss:0.24795
                                 validation_1-error:0.04947
        validation_0-logloss:0.22768
                                         validation_0-error:0.03939
[13]
validation_1-logloss:0.23638
                                 validation_1-error:0.04498
        validation_0-logloss:0.21693
                                         validation_0-error:0.03901
[14]
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
        validation_0-logloss:0.18282
                                         validation_0-error:0.03788
[18]
validation 1-logloss:0.19690
                                 validation 1-error:0.04198
        validation 0-logloss:0.17621
                                         validation 0-error:0.03713
[19]
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
        validation_0-logloss:0.15673
                                         validation_0-error:0.03526
[23]
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
        validation 0-logloss:0.14393
                                         validation 0-error:0.03226
[27]
validation_1-logloss:0.16311
                                 validation_1-error:0.03898
        validation_0-logloss:0.14180
                                         validation 0-error:0.03263
[28]
validation_1-logloss:0.16062
                                 validation_1-error:0.03898
        validation_0-logloss:0.13945
                                         validation_0-error:0.03226
[29]
validation_1-logloss:0.15940
                                 validation_1-error:0.04048
        validation_0-logloss:0.13661
[30]
                                         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
        validation 0-logloss:0.12954
[34]
                                         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
        validation_0-logloss:0.12696
                                         validation 0-error:0.03038
[36]
validation_1-logloss:0.15171
                                 validation_1-error:0.03748
        validation_0-logloss:0.12542
                                         validation_0-error:0.03038
[37]
validation_1-logloss:0.15095
                                 validation_1-error:0.03748
        validation_0-logloss:0.12469
                                         validation_0-error:0.03001
[38]
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
        validation 0-logloss:0.11957
                                         validation 0-error:0.02963
[43]
validation 1-logloss:0.14834
                                 validation 1-error:0.03598
Γ441
        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
        validation_0-logloss:0.11481
                                         validation_0-error:0.03001
[47]
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-error:0.03598
validation 1-logloss:0.14652
        validation 0-logloss:0.11034
[51]
                                         validation 0-error:0.02888
validation_1-logloss:0.14627
                                 validation_1-error:0.03448
        validation_0-logloss:0.10954
                                         validation_0-error:0.02888
[52]
validation_1-logloss:0.14648
                                 validation_1-error:0.03448
        validation_0-logloss:0.10872
                                         validation_0-error:0.02888
[53]
validation_1-logloss:0.14662
                                 validation_1-error:0.03448
        validation_0-logloss:0.10799
[54]
                                         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
        validation_0-logloss:0.10663
[56]
                                         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
        validation 0-logloss:0.10476
[58]
                                         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
        validation_0-logloss:0.10364
[60]
                                         validation_0-error:0.02738
validation_1-logloss:0.14676
                                 validation_1-error:0.03598
        validation_0-logloss:0.10329
                                         validation_0-error:0.02738
[61]
validation_1-logloss:0.14654
                                 validation_1-error:0.03598
        validation_0-logloss:0.10277
                                         validation_0-error:0.02738
[62]
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
        validation_0-logloss:0.10150
                                         validation_0-error:0.02701
[65]
validation_1-logloss:0.14661
                                validation_1-error:0.03448
        validation 0-logloss:0.10105
                                         validation_0-error:0.02663
[66]
validation 1-logloss:0.14640
                                validation 1-error:0.03598
        validation 0-logloss:0.10011
                                         validation 0-error:0.02626
[67]
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
        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
        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
Γ741
        validation 0-logloss:0.09541
                                         validation 0-error:0.02663
validation 1-logloss:0.14753
                                validation 1-error:0.03598
        validation 0-logloss:0.09507
[75]
                                         validation 0-error:0.02663
validation_1-logloss:0.14769
                                validation_1-error:0.03598
        validation_0-logloss:0.09480
                                         validation_0-error:0.02663
[76]
validation_1-logloss:0.14771
                                validation_1-error:0.03598
        validation_0-logloss:0.09387
[77]
                                         validation_0-error:0.02663
validation_1-logloss:0.14811
                                validation_1-error:0.03598
        validation_0-logloss:0.09365
[78]
                                         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
        validation_0-logloss:0.09135
                                         validation_0-error:0.02663
[81]
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
        validation_0-logloss:0.08891
[86]
                                         validation_0-error:0.02626
validation_1-logloss:0.14865
                                 validation 1-error:0.03598
        validation 0-logloss:0.08865
                                         validation 0-error:0.02588
[87]
validation 1-logloss:0.14841
                                 validation 1-error:0.03598
        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
        validation_0-logloss:0.08694
                                         validation_0-error:0.02588
[90]
validation_1-logloss:0.14927
                                 validation_1-error:0.03748
        validation_0-logloss:0.08671
[91]
                                         validation_0-error:0.02588
validation_1-logloss:0.14925
                                 validation 1-error:0.03748
        validation_0-logloss:0.08653
[92]
                                         validation_0-error:0.02588
validation_1-logloss:0.14952
                                 validation_1-error:0.03748
[93]
        validation_0-logloss:0.08545
                                         validation_0-error:0.02588
validation_1-logloss:0.14935
                                 validation_1-error:0.03748
[94]
        validation 0-logloss:0.08519
                                         validation_0-error:0.02588
                                 validation_1-error:0.03598
validation 1-logloss:0.14965
        validation 0-logloss:0.08438
                                         validation 0-error:0.02626
validation 1-logloss:0.15025
                                 validation 1-error:0.03898
[96]
        validation_0-logloss:0.08370
                                         validation_0-error:0.02626
validation 1-logloss:0.15020
                                 validation_1-error:0.03748
[97]
        validation_0-logloss:0.08349
                                         validation_0-error:0.02626
validation_1-logloss:0.15018
                                 validation_1-error:0.03748
        validation_0-logloss:0.08325
                                         validation_0-error:0.02626
[98]
validation_1-logloss:0.15035
                                 validation_1-error:0.03748
[99]
        validation_0-logloss:0.08316
                                         validation_0-error:0.02626
validation_1-logloss:0.15021
                                 validation_1-error:0.03748
[100]
        validation_0-logloss:0.08209
                                         validation_0-error:0.02626
validation_1-logloss:0.15037
                                 validation_1-error:0.03748
[101]
        validation_0-logloss:0.08119
                                         validation_0-error:0.02588
validation 1-logloss:0.15017
                                 validation 1-error:0.03598
        validation 0-logloss:0.08032
                                         validation 0-error:0.02588
[102]
validation 1-logloss:0.14997
                                 validation 1-error:0.03598
        validation 0-logloss:0.07996
                                         validation 0-error:0.02551
[103]
validation_1-logloss:0.15005
                                 validation 1-error:0.03748
        validation_0-logloss:0.07961
                                         validation_0-error:0.02551
[104]
validation_1-logloss:0.15017
                                 validation 1-error:0.03748
        validation_0-logloss:0.07916
                                         validation_0-error:0.02588
[105]
validation_1-logloss:0.14984
                                 validation_1-error:0.03898
[106]
        validation_0-logloss:0.07889
                                         validation_0-error:0.02588
validation_1-logloss:0.14988
                                 validation 1-error:0.03748
        validation_0-logloss:0.07867
[107]
                                         validation_0-error:0.02588
validation_1-logloss:0.14977
                                 validation_1-error:0.03748
[108]
        validation_0-logloss:0.07791
                                         validation_0-error:0.02476
validation_1-logloss:0.14998
                                 validation_1-error:0.03748
```

```
[109]
        validation_0-logloss:0.07761
                                         validation_0-error:0.02476
validation_1-logloss:0.15001
                                 validation_1-error:0.03748
        validation_0-logloss:0.07716
[110]
                                         validation_0-error:0.02476
validation_1-logloss:0.15045
                                 validation 1-error:0.03898
        validation 0-logloss:0.07690
                                         validation 0-error:0.02476
[1111]
validation 1-logloss:0.15066
                                 validation 1-error:0.03898
        validation 0-logloss:0.07626
                                         validation 0-error:0.02476
validation_1-logloss:0.15070
                                 validation 1-error:0.03898
        validation_0-logloss:0.07602
                                         validation 0-error:0.02476
[113]
validation_1-logloss:0.15084
                                 validation_1-error:0.03898
        validation_0-logloss:0.07592
                                         validation_0-error:0.02476
[114]
validation_1-logloss:0.15084
                                 validation_1-error:0.03898
        validation_0-logloss:0.07551
[115]
                                         validation_0-error:0.02476
validation_1-logloss:0.15092
                                 validation_1-error:0.03898
        validation_0-logloss:0.07531
[116]
                                         validation_0-error:0.02476
validation_1-logloss:0.15101
                                 validation_1-error:0.03898
[117]
        validation_0-logloss:0.07501
                                         validation_0-error:0.02438
validation_1-logloss:0.15090
                                 validation_1-error:0.03898
[118]
        validation_0-logloss:0.07478
                                         validation_0-error:0.02438
validation 1-logloss:0.15103
                                 validation 1-error:0.03898
        validation_0-logloss:0.07450
                                         validation 0-error:0.02438
validation 1-logloss:0.15108
                                 validation 1-error:0.03898
        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
        validation_0-logloss:0.50032
                                         validation_0-error:0.05326
[2]
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
        validation 0-logloss:0.35259
                                         validation 0-error:0.04276
validation 1-logloss:0.35754
                                 validation 1-error:0.05547
        validation 0-logloss:0.32671
                                         validation 0-error:0.04051
validation_1-logloss:0.33316
                                 validation 1-error:0.05697
        validation_0-logloss:0.30413
                                         validation_0-error:0.04051
[8]
validation_1-logloss:0.31113
                                 validation 1-error:0.05847
        validation_0-logloss:0.28422
                                         validation_0-error:0.03751
[9]
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
        validation_0-logloss:0.25151
[11]
                                         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
        validation_0-logloss:0.21454
[14]
                                         validation_0-error:0.03413
validation_1-logloss:0.22846
                                 validation 1-error:0.04348
        validation 0-logloss:0.20512
                                         validation 0-error:0.03226
Γ15]
validation 1-logloss:0.22055
                                 validation 1-error:0.04648
        validation 0-logloss:0.19640
                                         validation 0-error:0.03113
validation_1-logloss:0.21244
                                 validation 1-error:0.04498
        validation_0-logloss:0.18903
                                         validation 0-error:0.03113
[17]
validation_1-logloss:0.20558
                                 validation_1-error:0.04498
        validation_0-logloss:0.18243
                                         validation_0-error:0.03113
[18]
validation_1-logloss:0.19914
                                 validation_1-error:0.04498
        validation_0-logloss:0.17634
                                         validation_0-error:0.03038
[19]
validation_1-logloss:0.19455
                                 validation 1-error:0.04498
        validation_0-logloss:0.17098
[20]
                                         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
        validation 0-logloss:0.15751
                                         validation 0-error:0.02851
validation 1-logloss:0.17931
                                 validation 1-error:0.04498
        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
        validation_0-logloss:0.14739
                                         validation_0-error:0.02813
[26]
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
        validation 0-logloss:0.13727
                                         validation 0-error:0.02776
[30]
validation 1-logloss:0.16309
                                 validation 1-error:0.04348
        validation 0-logloss:0.13512
                                         validation 0-error:0.02701
[31]
validation_1-logloss:0.16072
                                 validation 1-error:0.04348
        validation_0-logloss:0.13202
                                         validation_0-error:0.02701
[32]
validation_1-logloss:0.15937
                                 validation 1-error:0.04198
        validation_0-logloss:0.12931
                                         validation_0-error:0.02701
[33]
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
        validation_0-logloss:0.12490
[35]
                                         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
        validation_0-logloss:0.12040
[38]
                                         validation_0-error:0.02663
validation_1-logloss:0.15364
                                 validation 1-error:0.04198
        validation 0-logloss:0.11951
                                         validation 0-error:0.02663
[39]
validation 1-logloss:0.15331
                                 validation 1-error:0.03898
        validation 0-logloss:0.11850
                                         validation 0-error:0.02626
validation_1-logloss:0.15314
                                 validation 1-error:0.03748
        validation_0-logloss:0.11719
                                         validation 0-error:0.02701
[41]
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
        validation_0-logloss:0.11494
[43]
                                         validation_0-error:0.02701
validation_1-logloss:0.15204
                                 validation 1-error:0.03748
        validation_0-logloss:0.11429
[44]
                                         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
        validation 0-logloss:0.11098
                                         validation 0-error:0.02701
validation 1-logloss:0.14941
                                 validation 1-error:0.03748
۲481
        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-error:0.03748
validation_1-logloss:0.14780
[53]
        validation_0-logloss:0.10703
                                         validation_0-error:0.02738
validation 1-logloss:0.14710
                                 validation 1-error:0.03748
        validation 0-logloss:0.10585
                                         validation 0-error:0.02738
[54]
validation 1-logloss:0.14762
                                 validation 1-error:0.03748
        validation 0-logloss:0.10506
                                         validation 0-error:0.02776
[55]
validation_1-logloss:0.14700
                                 validation 1-error:0.03748
        validation_0-logloss:0.10431
                                         validation_0-error:0.02776
[56]
validation_1-logloss:0.14674
                                 validation 1-error:0.03748
        validation_0-logloss:0.10386
                                         validation_0-error:0.02776
[57]
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
        validation_0-logloss:0.10261
[59]
                                         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
        validation_0-logloss:0.10090
                                         validation_0-error:0.02738
[62]
validation_1-logloss:0.14780
                                 validation 1-error:0.03748
        validation 0-logloss:0.10043
                                         validation 0-error:0.02738
[63]
validation 1-logloss:0.14818
                                 validation 1-error:0.03748
        validation 0-logloss:0.09935
                                         validation 0-error:0.02738
validation_1-logloss:0.14845
                                 validation 1-error:0.03598
        validation_0-logloss:0.09880
                                         validation 0-error:0.02738
[65]
validation_1-logloss:0.14866
                                 validation_1-error:0.03448
        validation_0-logloss:0.09817
                                         validation_0-error:0.02738
[66]
validation_1-logloss:0.14854
                                 validation_1-error:0.03598
        validation_0-logloss:0.09764
[67]
                                         validation_0-error:0.02738
validation_1-logloss:0.14865
                                 validation 1-error:0.03598
        validation_0-logloss:0.09714
[68]
                                         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
        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-error:0.03748
validation_1-logloss:0.14701
[77]
        validation_0-logloss:0.09271
                                         validation_0-error:0.02701
validation 1-logloss:0.14694
                                 validation 1-error:0.03748
        validation 0-logloss:0.09236
                                         validation 0-error:0.02663
validation 1-logloss:0.14692
                                 validation 1-error:0.03748
        validation 0-logloss:0.09200
                                         validation 0-error:0.02626
[79]
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
        validation_0-logloss:0.09064
                                         validation_0-error:0.02588
[81]
validation_1-logloss:0.14673
                                 validation_1-error:0.03748
[82]
        validation_0-logloss:0.09022
                                         validation_0-error:0.02588
validation_1-logloss:0.14708
                                 validation 1-error:0.03748
        validation_0-logloss:0.08985
[83]
                                         validation_0-error:0.02663
validation_1-logloss:0.14694
                                 validation_1-error:0.03748
[84]
        validation_0-logloss:0.08943
                                         validation_0-error:0.02626
validation_1-logloss:0.14642
                                 validation_1-error:0.03898
```

```
[85]
        validation_0-logloss:0.08896
                                         validation_0-error:0.02626
validation_1-logloss:0.14641
                                validation_1-error:0.03748
        validation_0-logloss:0.08867
                                         validation_0-error:0.02626
[86]
validation 1-logloss:0.14623
                                validation 1-error:0.03748
        validation 0-logloss:0.08832
                                         validation 0-error:0.02626
[87]
validation 1-logloss:0.14671
                                validation 1-error:0.03898
        validation 0-logloss:0.08817
                                         validation 0-error:0.02626
validation_1-logloss:0.14675
                                 validation 1-error:0.04048
        validation_0-logloss:0.08798
                                         validation 0-error:0.02626
[89]
validation_1-logloss:0.14709
                                validation_1-error:0.04048
        validation_0-logloss:0.08737
[90]
                                         validation_0-error:0.02551
validation_1-logloss:0.14685
                                validation_1-error:0.03898
        validation_0-logloss:0.08711
                                         validation_0-error:0.02513
[91]
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
validation_1-logloss:0.14658
                                validation_1-error:0.04048
[94]
        validation 0-logloss:0.08585
                                         validation_0-error:0.02476
validation 1-logloss:0.14687
                                validation 1-error:0.03898
        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
        validation_0-logloss:0.08375
                                         validation_0-error:0.02438
[98]
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
Γ1007
        validation_0-logloss:0.08296
                                         validation 0-error:0.02401
validation_1-logloss:0.14706
                                validation_1-error:0.04048
        validation_0-logloss:0.08269
[101]
                                         validation 0-error:0.02401
validation_1-logloss:0.14741
                                validation_1-error:0.04048
        validation_0-logloss:0.08233
                                         validation_0-error:0.02401
[102]
validation_1-logloss:0.14752
                                validation_1-error:0.04048
        validation_0-logloss:0.08204
                                         validation_0-error:0.02363
[103]
validation_1-logloss:0.14736
                                validation_1-error:0.03898
[104]
        validation_0-logloss:0.08173
                                         validation_0-error:0.02363
validation_1-logloss:0.14736
                                validation_1-error:0.04048
[105]
        validation_0-logloss:0.08151
                                         validation_0-error:0.02326
```

```
validation_1-logloss:0.14724
                                 validation_1-error:0.04048
        validation_0-logloss:0.08130
                                         validation_0-error:0.02326
[106]
validation_1-logloss:0.14755
                                 validation_1-error:0.03898
[107]
        validation_0-logloss:0.08117
                                         validation_0-error:0.02326
validation 1-logloss:0.14757
                                 validation 1-error:0.03898
[108]
        validation 0-logloss:0.08074
                                         validation 0-error:0.02251
validation 1-logloss:0.14752
                                 validation 1-error:0.03898
Γ1097
        validation_0-logloss:0.08021
                                         validation_0-error:0.02326
validation 1-logloss:0.14800
                                 validation 1-error:0.03898
[110]
        validation_0-logloss:0.07997
                                         validation_0-error:0.02288
validation_1-logloss:0.14763
                                 validation_1-error:0.03898
        validation_0-logloss:0.07984
                                         validation_0-error:0.02326
[111]
validation_1-logloss:0.14775
                                 validation_1-error:0.03748
        validation_0-logloss:0.07938
                                         validation_0-error:0.02288
[112]
validation_1-logloss:0.14743
                                 validation_1-error:0.03748
        validation_0-logloss:0.07915
                                         validation_0-error:0.02288
[113]
validation_1-logloss:0.14750
                                 validation_1-error:0.03898
[114]
        validation_0-logloss:0.07882
                                         validation_0-error:0.02288
validation_1-logloss:0.14735
                                 validation 1-error:0.03748
[115]
        validation 0-logloss:0.07866
                                         validation 0-error:0.02288
validation 1-logloss:0.14739
                                 validation 1-error:0.03598
        validation 0-logloss:0.07849
[116]
                                         validation 0-error:0.02288
validation_1-logloss:0.14727
                                 validation_1-error:0.03748
        validation_0-logloss:0.07796
                                         validation 0-error:0.02251
[117]
validation_1-logloss:0.14694
                                 validation_1-error:0.03748
        validation_0-logloss:0.07773
                                         validation_0-error:0.02288
[118]
validation_1-logloss:0.14701
                                 validation_1-error:0.04048
        validation_0-logloss:0.07760
[119]
                                         validation_0-error:0.02288
validation_1-logloss:0.14705
                                 validation 1-error:0.03898
        validation_0-logloss:0.61545
                                         validation_0-error:0.04989
validation_1-logloss:0.61817
                                 validation_1-error:0.07046
        validation_0-logloss:0.55171
[1]
                                         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
        validation 0-logloss:0.45329
[3]
                                         validation 0-error:0.04764
validation 1-logloss:0.46160
                                 validation 1-error:0.07196
        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
        validation_0-logloss:0.35303
                                         validation_0-error:0.04689
[6]
validation_1-logloss:0.36511
                                 validation_1-error:0.07046
        validation_0-logloss:0.32795
                                         validation_0-error:0.04614
[7]
validation_1-logloss:0.34127
                                 validation_1-error:0.06897
        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
        validation_0-logloss:0.25427
                                         validation_0-error:0.04501
[11]
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
Γ137
        validation_0-logloss:0.22826
                                         validation 0-error:0.03939
validation 1-logloss:0.24613
                                 validation 1-error:0.05697
                                         validation_0-error:0.04013
[14]
        validation_0-logloss:0.21746
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
        validation_0-logloss:0.19957
                                         validation_0-error:0.03788
[16]
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
Г197
        validation 0-logloss:0.17807
                                         validation 0-error:0.03638
validation 1-logloss:0.19880
                                 validation 1-error:0.04947
        validation 0-logloss:0.17291
                                         validation 0-error:0.03676
[20]
validation_1-logloss:0.19500
                                 validation 1-error:0.04947
        validation_0-logloss:0.16771
                                         validation_0-error:0.03601
[21]
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
        validation_0-logloss:0.15836
                                         validation_0-error:0.03601
[23]
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
        validation_0-logloss:0.15054
                                         validation_0-error:0.03526
[25]
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
        validation 0-logloss:0.14428
[27]
                                         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
        validation_0-logloss:0.13900
                                         validation 0-error:0.03301
[29]
validation_1-logloss:0.17290
                                 validation_1-error:0.04498
        validation_0-logloss:0.13725
[30]
                                         validation_0-error:0.03226
validation_1-logloss:0.17107
                                 validation_1-error:0.04498
        validation_0-logloss:0.13425
                                         validation_0-error:0.03151
[31]
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
        validation_0-logloss:0.12625
                                         validation_0-error:0.03151
[35]
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
                                         validation_0-error:0.03151
[38]
        validation_0-logloss:0.12143
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
        validation_0-logloss:0.11922
                                         validation_0-error:0.03151
[40]
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
Γ431
        validation 0-logloss:0.11665
                                         validation 0-error:0.03076
validation 1-logloss:0.16189
                                 validation 1-error:0.04048
        validation 0-logloss:0.11506
                                         validation 0-error:0.03038
[44]
validation_1-logloss:0.16202
                                 validation 1-error:0.04198
        validation_0-logloss:0.11355
                                         validation 0-error:0.03001
[45]
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
        validation_0-logloss:0.11081
                                         validation_0-error:0.02963
[47]
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
        validation_0-logloss:0.10895
[49]
                                         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
validation 1-logloss:0.16025
                                 validation 1-error:0.04348
        validation 0-logloss:0.10761
[51]
                                         validation 0-error:0.02926
validation 1-logloss:0.15997
                                 validation 1-error:0.04498
[52]
        validation_0-logloss:0.10693
                                         validation 0-error:0.02926
validation_1-logloss:0.16066
                                 validation_1-error:0.04498
        validation_0-logloss:0.10624
                                         validation 0-error:0.02926
[53]
validation_1-logloss:0.16084
                                 validation_1-error:0.04798
        validation_0-logloss:0.10506
[54]
                                         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
validation_1-logloss:0.16105
                                 validation_1-error:0.04498
[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
```

```
validation_1-logloss:0.16175
                                 validation_1-error:0.04648
[58]
        validation_0-logloss:0.10293
                                         validation_0-error:0.02776
validation_1-logloss:0.16102
                                 validation_1-error:0.04648
[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
        validation_0-logloss:0.10014
[62]
                                         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
        validation_0-logloss:0.09867
                                         validation_0-error:0.02663
[64]
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
        validation 0-logloss:0.09580
                                         validation 0-error:0.02626
[68]
validation_1-logloss:0.16131
                                 validation 1-error:0.04498
        validation_0-logloss:0.09546
                                         validation 0-error:0.02588
[69]
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
        validation_0-logloss:0.09435
[71]
                                         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
        validation 0-logloss:0.09288
[75]
                                         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
        validation_0-logloss:0.09215
[77]
                                         validation 0-error:0.02513
validation_1-logloss:0.16031
                                 validation_1-error:0.04498
        validation_0-logloss:0.09170
[78]
                                         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
[82]
        validation_0-logloss:0.09005
                                         validation_0-error:0.02476
validation_1-logloss:0.15967
                                validation_1-error:0.04198
        validation 0-logloss:0.08957
                                         validation_0-error:0.02438
[83]
validation 1-logloss:0.15950
                                validation 1-error:0.04198
        validation 0-logloss:0.08909
                                         validation 0-error:0.02438
Г841
                                validation_1-error:0.04198
validation 1-logloss:0.15972
[85]
        validation_0-logloss:0.08888
                                         validation_0-error:0.02438
validation 1-logloss:0.15975
                                validation 1-error:0.04198
[86]
        validation_0-logloss:0.08843
                                         validation_0-error:0.02476
validation_1-logloss:0.15951
                                validation_1-error:0.04198
[87]
        validation_0-logloss:0.08817
                                         validation_0-error:0.02476
validation_1-logloss:0.15936
                                validation_1-error:0.04348
        validation_0-logloss:0.08793
                                         validation_0-error:0.02438
[88]
validation_1-logloss:0.15930
                                validation_1-error:0.04348
[89]
        validation_0-logloss:0.08722
                                         validation_0-error:0.02401
validation_1-logloss:0.15951
                                validation_1-error:0.04498
[90]
        validation_0-logloss:0.08679
                                         validation_0-error:0.02401
validation_1-logloss:0.15949
                                validation 1-error:0.04348
Г917
        validation 0-logloss:0.08624
                                         validation 0-error:0.02363
validation 1-logloss:0.15963
                                validation 1-error:0.04498
        validation 0-logloss:0.08571
                                         validation_0-error:0.02363
[92]
validation_1-logloss:0.16007
                                validation 1-error:0.04498
        validation 0-logloss:0.08553
                                         validation_0-error:0.02363
[93]
validation_1-logloss:0.16022
                                validation_1-error:0.04498
        validation_0-logloss:0.08510
                                         validation_0-error:0.02363
[94]
validation_1-logloss:0.16004
                                validation_1-error:0.04498
        validation_0-logloss:0.08488
[95]
                                         validation_0-error:0.02363
validation_1-logloss:0.15988
                                validation 1-error:0.04648
[96]
        validation_0-logloss:0.08483
                                         validation_0-error:0.02363
validation_1-logloss:0.15980
                                validation_1-error:0.04648
        validation_0-logloss:0.08431
[97]
                                         validation_0-error:0.02326
validation_1-logloss:0.15994
                                validation_1-error:0.04498
[98]
        validation_0-logloss:0.08410
                                         validation_0-error:0.02363
validation 1-logloss:0.15992
                                validation 1-error:0.04498
        validation 0-logloss:0.08398
[99]
                                         validation 0-error:0.02363
validation 1-logloss:0.15976
                                validation 1-error:0.04648
[100]
        validation_0-logloss:0.08368
                                         validation 0-error:0.02326
validation_1-logloss:0.15944
                                validation_1-error:0.04648
        validation 0-logloss:0.08324
[101]
                                         validation 0-error:0.02326
validation_1-logloss:0.15967
                                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)
```

```
[102]
        validation_0-logloss:0.08316
                                         validation_0-error:0.02363
validation_1-logloss:0.15957
                                 validation_1-error:0.04648
        validation_0-logloss:0.08300
[103]
                                         validation_0-error:0.02326
validation 1-logloss:0.15967
                                 validation 1-error:0.04648
Γ1047
        validation 0-logloss:0.08238
                                         validation 0-error:0.02251
validation 1-logloss:0.16006
                                 validation 1-error:0.04648
        validation 0-logloss:0.08193
                                         validation 0-error:0.02213
validation_1-logloss:0.16001
                                 validation 1-error:0.04648
        validation_0-logloss:0.08171
                                         validation 0-error:0.02213
[106]
validation_1-logloss:0.15974
                                 validation_1-error:0.04648
        validation_0-logloss:0.08142
                                         validation_0-error:0.02213
[107]
validation_1-logloss:0.16001
                                 validation_1-error:0.04648
        validation_0-logloss:0.08121
                                         validation_0-error:0.02176
[108]
validation_1-logloss:0.16010
                                 validation 1-error:0.04648
        validation_0-logloss:0.08113
[109]
                                         validation_0-error:0.02138
validation_1-logloss:0.16010
                                 validation_1-error:0.04648
[110]
        validation_0-logloss:0.08050
                                         validation_0-error:0.02138
validation_1-logloss:0.16051
                                 validation_1-error:0.04648
                                         validation_0-error:0.02138
[111]
        validation 0-logloss:0.08011
validation 1-logloss:0.16040
                                 validation 1-error:0.04648
        validation 0-logloss:0.07969
[112]
                                         validation 0-error:0.02100
validation 1-logloss:0.16058
                                 validation 1-error:0.04648
Γ1137
        validation_0-logloss:0.07963
                                         validation_0-error:0.02100
validation 1-logloss:0.16029
                                 validation_1-error:0.04648
[114]
        validation_0-logloss:0.07923
                                         validation_0-error:0.02100
validation_1-logloss:0.16000
                                 validation_1-error:0.04648
        validation_0-logloss:0.07913
                                         validation_0-error:0.02100
[115]
validation_1-logloss:0.15976
                                 validation_1-error:0.04648
[116]
        validation_0-logloss:0.07876
                                         validation 0-error:0.02063
validation_1-logloss:0.16016
                                 validation_1-error:0.04798
[117]
        validation_0-logloss:0.07823
                                         validation_0-error:0.02025
validation_1-logloss:0.16076
                                 validation_1-error:0.04648
[118]
        validation_0-logloss:0.07818
                                         validation_0-error:0.02025
validation 1-logloss:0.16066
                                 validation 1-error:0.04498
        validation 0-logloss:0.07771
                                         validation 0-error:0.02025
[119]
validation 1-logloss:0.16085
                                 validation 1-error:0.04498
        validation 0-logloss:0.61582
                                         validation 0-error:0.05064
validation_1-logloss:0.61818
                                 validation 1-error:0.06747
        validation_0-logloss:0.55229
                                         validation_0-error:0.04726
[1]
validation_1-logloss:0.55660
                                 validation 1-error:0.06597
        validation_0-logloss:0.49964
                                         validation_0-error:0.04689
[2]
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
        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
        validation_0-logloss:0.33069
                                         validation_0-error:0.04501
[7]
validation_1-logloss:0.34228
                                 validation 1-error:0.06297
        validation 0-logloss:0.30717
                                         validation 0-error:0.04501
[8]
validation 1-logloss:0.31941
                                 validation 1-error:0.06297
        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
validation_1-logloss:0.28309
                                 validation_1-error:0.06147
        validation_0-logloss:0.25326
                                         validation_0-error:0.03901
[11]
validation_1-logloss:0.26720
                                 validation_1-error:0.05847
        validation_0-logloss:0.23927
[12]
                                         validation_0-error:0.03751
validation_1-logloss:0.25365
                                 validation_1-error:0.05247
        validation_0-logloss:0.22708
[13]
                                         validation_0-error:0.03751
validation_1-logloss:0.24224
                                 validation_1-error:0.05397
[14]
        validation_0-logloss:0.21613
                                         validation_0-error:0.03751
validation_1-logloss:0.23222
                                 validation_1-error:0.05397
[15]
        validation_0-logloss:0.20626
                                         validation_0-error:0.03638
validation 1-logloss:0.22340
                                 validation 1-error:0.05397
        validation_0-logloss:0.19709
                                         validation 0-error:0.03638
validation 1-logloss:0.21558
                                 validation 1-error:0.05547
        validation_0-logloss:0.18958
                                         validation_0-error:0.03601
validation_1-logloss:0.20893
                                 validation_1-error:0.05247
[18]
        validation_0-logloss:0.18252
                                         validation_0-error:0.03451
validation_1-logloss:0.20247
                                 validation_1-error:0.05097
        validation_0-logloss:0.17668
                                         validation_0-error:0.03413
[19]
validation_1-logloss:0.19726
                                 validation_1-error:0.04798
[20]
        validation_0-logloss:0.17124
                                         validation_0-error:0.03451
validation_1-logloss:0.19252
                                 validation_1-error:0.04798
[21]
        validation_0-logloss:0.16594
                                         validation_0-error:0.03413
                                 validation_1-error:0.04798
validation_1-logloss:0.18831
[22]
        validation_0-logloss:0.16169
                                         validation_0-error:0.03338
validation_1-logloss:0.18463
                                 validation 1-error:0.04798
        validation 0-logloss:0.15795
                                         validation 0-error:0.03301
validation 1-logloss:0.18200
                                 validation 1-error:0.04947
        validation 0-logloss:0.15417
                                         validation 0-error:0.03301
[24]
validation_1-logloss:0.17755
                                 validation 1-error:0.04798
        validation_0-logloss:0.15071
                                         validation_0-error:0.03263
[25]
validation_1-logloss:0.17556
                                 validation 1-error:0.04798
        validation_0-logloss:0.14747
                                         validation_0-error:0.03188
[26]
validation_1-logloss:0.17204
                                 validation_1-error:0.04798
[27]
        validation_0-logloss:0.14470
                                         validation_0-error:0.03076
validation_1-logloss:0.16952
                                 validation 1-error:0.04798
        validation_0-logloss:0.14194
[28]
                                         validation_0-error:0.03113
validation_1-logloss:0.16635
                                 validation_1-error:0.04798
[29]
        validation_0-logloss:0.13873
                                         validation_0-error:0.03076
validation_1-logloss:0.16463
                                 validation_1-error:0.04798
```

```
[30]
        validation_0-logloss:0.13655
                                         validation_0-error:0.03076
validation_1-logloss:0.16275
                                 validation_1-error:0.04798
        validation_0-logloss:0.13368
                                         validation_0-error:0.03076
[31]
validation_1-logloss:0.16142
                                 validation 1-error:0.04798
        validation 0-logloss:0.13139
                                         validation 0-error:0.03038
Γ321
validation 1-logloss:0.15977
                                 validation 1-error:0.04648
        validation 0-logloss:0.12956
                                         validation 0-error:0.03001
validation_1-logloss:0.15889
                                 validation 1-error:0.04648
        validation_0-logloss:0.12808
                                         validation 0-error:0.03001
[34]
validation_1-logloss:0.15880
                                 validation_1-error:0.04648
        validation_0-logloss:0.12644
                                         validation_0-error:0.03001
[35]
validation_1-logloss:0.15686
                                 validation_1-error:0.04648
        validation_0-logloss:0.12481
[36]
                                         validation_0-error:0.02926
validation_1-logloss:0.15544
                                 validation_1-error:0.04498
        validation_0-logloss:0.12374
[37]
                                         validation_0-error:0.02926
validation_1-logloss:0.15513
                                 validation_1-error:0.04648
[38]
        validation_0-logloss:0.12191
                                         validation_0-error:0.02888
validation_1-logloss:0.15450
                                 validation_1-error:0.04498
[39]
        validation_0-logloss:0.12061
                                         validation_0-error:0.02851
validation 1-logloss:0.15375
                                 validation 1-error:0.04348
        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
validation_1-logloss:0.15325
                                 validation_1-error:0.04348
        validation_0-logloss:0.11539
                                         validation_0-error:0.02851
[43]
validation_1-logloss:0.15381
                                 validation_1-error:0.04498
[44]
        validation_0-logloss:0.11381
                                         validation_0-error:0.02813
validation_1-logloss:0.15325
                                 validation_1-error:0.04348
[45]
        validation_0-logloss:0.11299
                                         validation_0-error:0.02813
validation_1-logloss:0.15316
                                 validation_1-error:0.04498
[46]
        validation_0-logloss:0.11233
                                         validation_0-error:0.02776
validation_1-logloss:0.15310
                                 validation 1-error:0.04498
        validation 0-logloss:0.11137
                                         validation 0-error:0.02776
validation 1-logloss:0.15354
                                 validation 1-error:0.04498
        validation 0-logloss:0.11046
                                         validation 0-error:0.02776
[48]
validation_1-logloss:0.15316
                                 validation 1-error:0.04498
[49]
        validation_0-logloss:0.10909
                                         validation_0-error:0.02738
validation_1-logloss:0.15295
                                 validation 1-error:0.04498
        validation_0-logloss:0.10767
                                         validation_0-error:0.02738
[50]
validation_1-logloss:0.15349
                                 validation_1-error:0.04498
[51]
        validation_0-logloss:0.10705
                                         validation_0-error:0.02738
validation_1-logloss:0.15326
                                 validation 1-error:0.04498
        validation_0-logloss:0.10666
[52]
                                         validation_0-error:0.02738
validation_1-logloss:0.15358
                                 validation_1-error:0.04498
[53]
        validation_0-logloss:0.10577
                                         validation_0-error:0.02738
validation_1-logloss:0.15371
                                 validation_1-error:0.04498
```

```
[54]
        validation_0-logloss:0.10462
                                         validation_0-error:0.02663
validation_1-logloss:0.15440
                                 validation_1-error:0.04348
        validation_0-logloss:0.10396
[55]
                                         validation_0-error:0.02701
validation_1-logloss:0.15412
                                 validation 1-error:0.04348
        validation 0-logloss:0.10323
                                         validation 0-error:0.02663
[56]
validation 1-logloss:0.15455
                                 validation 1-error:0.04348
        validation 0-logloss:0.10224
                                         validation 0-error:0.02701
validation_1-logloss:0.15417
                                 validation 1-error:0.04348
[58]
        validation_0-logloss:0.10204
                                         validation 0-error:0.02663
validation_1-logloss:0.15435
                                 validation_1-error:0.04198
        validation_0-logloss:0.10147
                                         validation_0-error:0.02701
[59]
validation_1-logloss:0.15435
                                 validation_1-error:0.04348
        validation_0-logloss:0.10080
[60]
                                         validation_0-error:0.02626
validation_1-logloss:0.15421
                                 validation 1-error:0.04348
        validation_0-logloss:0.10037
[61]
                                         validation_0-error:0.02663
validation_1-logloss:0.15423
                                 validation_1-error:0.04648
[62]
        validation_0-logloss:0.09975
                                         validation_0-error:0.02626
validation_1-logloss:0.15423
                                 validation_1-error:0.04648
[63]
        validation 0-logloss:0.09906
                                         validation_0-error:0.02626
validation 1-logloss:0.15441
                                 validation 1-error:0.04648
        validation 0-logloss:0.09853
                                         validation 0-error:0.02626
validation 1-logloss:0.15389
                                 validation 1-error:0.04498
        validation_0-logloss:0.09744
                                         validation_0-error:0.02626
validation_1-logloss:0.15401
                                 validation 1-error:0.04348
[66]
        validation_0-logloss:0.09691
                                         validation_0-error:0.02663
validation_1-logloss:0.15388
                                 validation_1-error:0.04498
        validation_0-logloss:0.09624
                                         validation_0-error:0.02626
[67]
validation_1-logloss:0.15323
                                 validation_1-error:0.04348
[68]
        validation_0-logloss:0.09565
                                         validation_0-error:0.02626
validation_1-logloss:0.15304
                                 validation_1-error:0.04198
[69]
        validation_0-logloss:0.09527
                                         validation_0-error:0.02626
validation_1-logloss:0.15303
                                 validation_1-error:0.04198
[70]
        validation_0-logloss:0.09464
                                         validation_0-error:0.02663
validation 1-logloss:0.15263
                                 validation 1-error:0.04048
        validation 0-logloss:0.09430
                                         validation 0-error:0.02626
validation 1-logloss:0.15253
                                 validation 1-error:0.04048
[72]
        validation 0-logloss:0.09326
                                         validation 0-error:0.02663
validation_1-logloss:0.15278
                                 validation 1-error:0.04048
        validation_0-logloss:0.09259
                                         validation_0-error:0.02626
[73]
validation_1-logloss:0.15272
                                 validation 1-error:0.04048
        validation_0-logloss:0.09222
                                         validation_0-error:0.02626
[74]
validation_1-logloss:0.15290
                                 validation_1-error:0.04048
[75]
        validation_0-logloss:0.09165
                                         validation_0-error:0.02626
validation_1-logloss:0.15310
                                 validation 1-error:0.04048
        validation_0-logloss:0.09123
[76]
                                         validation_0-error:0.02663
validation_1-logloss:0.15317
                                 validation_1-error:0.04048
[77]
        validation_0-logloss:0.09090
                                         validation_0-error:0.02663
validation_1-logloss:0.15299
                                 validation_1-error:0.04048
```

```
[78]
        validation_0-logloss:0.09056
                                         validation_0-error:0.02626
validation_1-logloss:0.15266
                                 validation_1-error:0.04048
        validation_0-logloss:0.09006
[79]
                                         validation_0-error:0.02588
validation_1-logloss:0.15240
                                 validation 1-error:0.03898
        validation 0-logloss:0.08953
                                         validation 0-error:0.02588
[80]
validation 1-logloss:0.15267
                                 validation 1-error:0.03898
        validation 0-logloss:0.08819
                                         validation 0-error:0.02626
validation_1-logloss:0.15286
                                 validation 1-error:0.03898
[82]
        validation_0-logloss:0.08804
                                         validation 0-error:0.02626
validation_1-logloss:0.15315
                                 validation_1-error:0.03898
        validation_0-logloss:0.08771
                                         validation_0-error:0.02626
[83]
validation_1-logloss:0.15341
                                 validation_1-error:0.03898
        validation_0-logloss:0.08755
[84]
                                         validation_0-error:0.02626
validation_1-logloss:0.15348
                                 validation 1-error:0.03898
        validation_0-logloss:0.08721
[85]
                                         validation_0-error:0.02551
validation_1-logloss:0.15331
                                 validation_1-error:0.03898
[86]
        validation_0-logloss:0.08615
                                         validation_0-error:0.02513
validation_1-logloss:0.15295
                                 validation_1-error:0.03898
[87]
        validation_0-logloss:0.08591
                                         validation_0-error:0.02513
validation 1-logloss:0.15333
                                 validation 1-error:0.03898
        validation 0-logloss:0.08554
                                         validation 0-error:0.02513
validation 1-logloss:0.15361
                                 validation 1-error:0.03898
        validation_0-logloss:0.08515
                                         validation_0-error:0.02476
validation 1-logloss:0.15349
                                 validation 1-error:0.03898
[90]
        validation_0-logloss:0.08485
                                         validation_0-error:0.02513
validation_1-logloss:0.15345
                                 validation_1-error:0.03898
        validation_0-logloss:0.08422
                                         validation_0-error:0.02513
[91]
validation_1-logloss:0.15400
                                 validation_1-error:0.04048
[92]
        validation_0-logloss:0.08400
                                         validation_0-error:0.02476
validation_1-logloss:0.15377
                                 validation_1-error:0.04048
[93]
        validation_0-logloss:0.08300
                                         validation_0-error:0.02513
validation_1-logloss:0.15378
                                 validation_1-error:0.04048
[94]
        validation_0-logloss:0.08224
                                         validation_0-error:0.02476
validation 1-logloss:0.15407
                                 validation 1-error:0.04198
        validation 0-logloss:0.08173
                                         validation 0-error:0.02438
validation 1-logloss:0.15401
                                 validation 1-error:0.04198
        validation 0-logloss:0.08124
                                         validation 0-error:0.02438
[96]
validation_1-logloss:0.15432
                                 validation 1-error:0.04198
        validation_0-logloss:0.08097
                                         validation_0-error:0.02363
[97]
validation_1-logloss:0.15398
                                 validation 1-error:0.04198
        validation_0-logloss:0.08057
                                         validation_0-error:0.02401
[98]
validation_1-logloss:0.15445
                                 validation_1-error:0.04198
[99]
        validation_0-logloss:0.08038
                                         validation_0-error:0.02401
validation_1-logloss:0.15442
                                 validation 1-error:0.04198
        validation_0-logloss:0.08019
[100]
                                         validation_0-error:0.02363
validation_1-logloss:0.15411
                                 validation_1-error:0.04048
[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)

validation 0-logloss:0.07943 validation 0-error:0.02326 validation_1-logloss:0.15462 validation_1-error:0.04048 Γ1037 validation 0-logloss:0.07916 validation 0-error:0.02326 validation 1-logloss:0.15475 validation 1-error:0.04048 [104] validation 0-logloss:0.07884 validation 0-error:0.02363 validation_1-logloss:0.15506 validation_1-error:0.04048 [105] validation_0-logloss:0.07842 validation_0-error:0.02363 validation_1-logloss:0.15498 validation_1-error:0.04048 validation_0-logloss:0.07777 [106] validation_0-error:0.02363 validation_1-logloss:0.15519 validation_1-error:0.04048 [107] validation_0-logloss:0.07739 validation_0-error:0.02326 validation 1-logloss:0.15555 validation 1-error:0.04048 validation_0-logloss:0.07670 validation_0-error:0.02288 [108] validation 1-logloss:0.15506 validation 1-error:0.04048 [109] validation_0-logloss:0.07652 validation_0-error:0.02288 validation 1-logloss:0.15467 validation 1-error:0.04048 validation_0-logloss:0.07622 validation_0-error:0.02326 [110] validation 1-logloss:0.15478 validation 1-error:0.04048 validation_0-logloss:0.07593 validation_0-error:0.02251 validation 1-logloss:0.15490 validation_1-error:0.04048 [112] validation_0-logloss:0.07580 validation_0-error:0.02213 validation_1-logloss:0.15501 validation_1-error:0.04048 [113] validation_0-logloss:0.07555 validation_0-error:0.02251 validation_1-logloss:0.15487 validation_1-error:0.04048 validation_0-logloss:0.07522 validation_0-error:0.02251 [114]validation_1-logloss:0.15469 validation_1-error:0.04048 validation_0-logloss:0.07508 validation_0-error:0.02251 validation_1-logloss:0.15462 validation 1-error:0.04048 [116] validation_0-logloss:0.07475 validation_0-error:0.02288 validation_1-logloss:0.15458 validation_1-error:0.04048 validation_0-logloss:0.07416 validation 0-error:0.02251 [117]validation_1-logloss:0.15477 validation_1-error:0.04048 validation 0-logloss:0.07391 validation 0-error:0.02176 Г118**]** validation_1-logloss:0.15462 validation_1-error:0.04048 [119] validation_0-logloss:0.07347 validation 0-error:0.02176 validation_1-logloss:0.15511 validation_1-error:0.04048 [0] validation_0-logloss:0.65660 validation_0-error:0.07277 validation_1-logloss:0.65761 validation_1-error:0.08546 validation_0-logloss:0.62351 [1] 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
        validation_0-logloss:0.56571
                                         validation_0-error:0.05851
[3]
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
        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
                                         validation_0-error:0.05851
[7]
        validation_0-logloss:0.47571
validation_1-logloss:0.48110
                                 validation_1-error:0.06897
        validation_0-logloss:0.45725
                                         validation_0-error:0.05851
[8]
validation_1-logloss:0.46312
                                 validation_1-error:0.06897
        validation_0-logloss:0.44024
                                         validation_0-error:0.05851
validation_1-logloss:0.44673
                                 validation_1-error:0.06897
[10]
        validation_0-logloss:0.42433
                                         validation_0-error:0.05851
validation_1-logloss:0.43172
                                 validation_1-error:0.06897
        validation_0-logloss:0.40961
                                         validation_0-error:0.05851
[11]
validation_1-logloss:0.41709
                                 validation 1-error:0.06897
Γ12]
        validation 0-logloss:0.39581
                                         validation 0-error:0.05664
validation 1-logloss:0.40411
                                 validation 1-error:0.07046
        validation 0-logloss:0.38299
                                         validation 0-error:0.05664
[13]
validation_1-logloss:0.39141
                                 validation_1-error:0.07046
        validation_0-logloss:0.37100
                                         validation_0-error:0.05664
[14]
validation_1-logloss:0.38021
                                 validation_1-error:0.07046
        validation_0-logloss:0.35988
                                         validation_0-error:0.05664
[15]
validation_1-logloss:0.36957
                                 validation_1-error:0.07046
        validation_0-logloss:0.34820
                                         validation_0-error:0.05626
[16]
validation_1-logloss:0.35758
                                 validation 1-error:0.07046
[17]
        validation_0-logloss:0.33723
                                         validation_0-error:0.05626
validation_1-logloss:0.34653
                                 validation_1-error:0.07046
        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
        validation 0-logloss:0.30785
[20]
                                         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
        validation_0-logloss:0.29068
[22]
                                         validation 0-error:0.05364
validation_1-logloss:0.30091
                                 validation_1-error:0.06747
        validation_0-logloss:0.28295
[23]
                                         validation_0-error:0.05514
validation_1-logloss:0.29356
                                 validation_1-error:0.06747
        validation_0-logloss:0.27570
                                         validation_0-error:0.05064
[24]
validation_1-logloss:0.28654
                                 validation_1-error:0.06297
[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
validation_1-logloss:0.26737
                                 validation_1-error:0.05847
[28]
        validation_0-logloss:0.25057
                                         validation 0-error:0.04389
validation 1-logloss:0.26215
                                 validation 1-error:0.05547
[29]
        validation 0-logloss:0.24520
                                         validation 0-error:0.04201
                                 validation_1-error:0.05547
validation 1-logloss:0.25676
[30]
        validation_0-logloss:0.24012
                                         validation 0-error:0.04239
validation 1-logloss:0.25193
                                 validation 1-error:0.05547
                                         validation_0-error:0.04163
[31]
        validation_0-logloss:0.23537
validation_1-logloss:0.24732
                                 validation_1-error:0.05397
[32]
        validation_0-logloss:0.23098
                                         validation_0-error:0.04088
validation_1-logloss:0.24277
                                 validation_1-error:0.05247
        validation_0-logloss:0.22665
                                         validation_0-error:0.04013
[33]
validation_1-logloss:0.23872
                                 validation_1-error:0.04947
[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
validation 1-logloss:0.22645
                                 validation 1-error:0.04798
        validation 0-logloss:0.21108
[37]
                                         validation 0-error:0.03788
validation_1-logloss:0.22352
                                 validation_1-error:0.04798
        validation 0-logloss:0.20779
                                         validation 0-error:0.03788
[38]
validation_1-logloss:0.21986
                                 validation_1-error:0.04648
        validation_0-logloss:0.20456
                                         validation_0-error:0.03826
[39]
validation_1-logloss:0.21682
                                 validation_1-error:0.04798
        validation_0-logloss:0.20171
[40]
                                         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
        validation_0-logloss:0.19570
[42]
                                         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
        validation 0-logloss:0.19008
Γ441
                                         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
validation_1-logloss:0.20031
                                 validation_1-error:0.04348
Г461
        validation_0-logloss:0.18526
                                         validation 0-error:0.03526
validation_1-logloss:0.19755
                                 validation_1-error:0.04348
[47]
        validation_0-logloss:0.18284
                                         validation_0-error:0.03526
validation_1-logloss:0.19452
                                 validation_1-error:0.04348
        validation_0-logloss:0.18089
                                         validation_0-error:0.03488
[48]
validation_1-logloss:0.19283
                                 validation_1-error:0.04498
        validation_0-logloss:0.17875
                                         validation_0-error:0.03488
validation_1-logloss:0.19091
                                 validation_1-error:0.04498
[0]
        validation_0-logloss:0.65635
                                         validation_0-error:0.07164
```

```
validation_1-logloss:0.65721
                                 validation_1-error:0.09145
        validation_0-logloss:0.62301
                                         validation_0-error:0.07127
[1]
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
        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
                                         validation_0-error:0.06452
        validation_0-logloss:0.51600
validation_1-logloss:0.51943
                                 validation_1-error:0.07496
        validation_0-logloss:0.49448
                                         validation_0-error:0.05289
[6]
validation_1-logloss:0.49825
                                 validation_1-error:0.05847
        validation_0-logloss:0.47437
                                         validation_0-error:0.05251
validation_1-logloss:0.47874
                                 validation_1-error:0.05397
        validation_0-logloss:0.45587
                                         validation_0-error:0.05251
validation_1-logloss:0.46044
                                 validation_1-error:0.05397
        validation_0-logloss:0.43873
                                         validation_0-error:0.05251
validation_1-logloss:0.44395
                                 validation 1-error:0.05397
Γ107
        validation 0-logloss:0.42282
                                         validation 0-error:0.05251
validation 1-logloss:0.42863
                                 validation 1-error:0.05397
        validation 0-logloss:0.40796
[11]
                                         validation 0-error:0.05251
validation_1-logloss:0.41410
                                 validation_1-error:0.05397
        validation 0-logloss:0.39412
                                         validation_0-error:0.05251
[12]
validation_1-logloss:0.40060
                                 validation_1-error:0.05397
        validation_0-logloss:0.38123
                                         validation_0-error:0.05251
[13]
validation_1-logloss:0.38834
                                 validation_1-error:0.05397
        validation_0-logloss:0.36919
[14]
                                         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
        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
        validation 0-logloss:0.32619
[18]
                                         validation 0-error:0.05364
validation 1-logloss:0.33253
                                 validation 1-error:0.05697
Г197
        validation_0-logloss:0.31621
                                         validation 0-error:0.05364
validation_1-logloss:0.32277
                                 validation_1-error:0.05547
        validation_0-logloss:0.30685
[20]
                                         validation 0-error:0.05401
validation_1-logloss:0.31383
                                 validation_1-error:0.05847
[21]
        validation_0-logloss:0.29816
                                         validation_0-error:0.05401
validation_1-logloss:0.30530
                                 validation_1-error:0.05847
[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
        validation_0-logloss:0.26848
                                         validation_0-error:0.05289
[25]
validation_1-logloss:0.27616
                                validation_1-error:0.05397
        validation 0-logloss:0.26228
                                         validation 0-error:0.05289
[26]
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
        validation 0-logloss:0.25044
                                        validation 0-error:0.05139
validation 1-logloss:0.25882
                                validation 1-error:0.04947
        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
        validation_0-logloss:0.23569
                                         validation_0-error:0.04314
[31]
validation_1-logloss:0.24416
                                validation_1-error:0.04648
        validation_0-logloss:0.23107
                                         validation 0-error:0.04389
[32]
validation_1-logloss:0.24003
                                validation_1-error:0.04798
        validation_0-logloss:0.22665
                                         validation_0-error:0.04389
[33]
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
        validation 0-logloss:0.21855
                                         validation 0-error:0.04276
validation 1-logloss:0.22869
                                validation 1-error:0.04798
                                         validation_0-error:0.04239
        validation 0-logloss:0.21435
validation_1-logloss:0.22373
                                validation 1-error:0.04798
        validation_0-logloss:0.21097
                                         validation_0-error:0.04239
[37]
validation_1-logloss:0.22071
                                validation 1-error:0.04798
        validation_0-logloss:0.20745
                                        validation_0-error:0.04088
[38]
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
[40]
        validation_0-logloss:0.20135
                                         validation_0-error:0.04088
validation_1-logloss:0.21103
                                validation_1-error:0.04648
[41]
        validation_0-logloss:0.19809
                                        validation_0-error:0.04088
validation_1-logloss:0.20724
                                validation_1-error:0.04648
```

```
[42]
        validation_0-logloss:0.19538
                                         validation_0-error:0.04088
validation_1-logloss:0.20480
                                 validation_1-error:0.04648
        validation_0-logloss:0.19282
                                         validation_0-error:0.04051
[43]
validation_1-logloss:0.20266
                                 validation 1-error:0.04498
        validation 0-logloss:0.19022
                                         validation 0-error:0.03939
Γ441
validation 1-logloss:0.19973
                                 validation 1-error:0.04348
        validation 0-logloss:0.18790
                                         validation 0-error:0.03939
validation_1-logloss:0.19771
                                 validation 1-error:0.04348
[46]
        validation_0-logloss:0.18535
                                         validation 0-error:0.03901
validation_1-logloss:0.19451
                                 validation_1-error:0.04348
        validation_0-logloss:0.18329
                                         validation_0-error:0.03901
[47]
validation_1-logloss:0.19288
                                 validation_1-error:0.04348
        validation_0-logloss:0.18098
                                         validation_0-error:0.03901
[48]
validation_1-logloss:0.19016
                                 validation_1-error:0.04348
        validation_0-logloss:0.17901
[49]
                                         validation_0-error:0.03939
validation_1-logloss:0.18861
                                 validation_1-error:0.04348
[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
                                         validation 0-error:0.06827
        validation_0-logloss:0.59264
validation 1-logloss:0.59488
                                 validation 1-error:0.08546
        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
        validation_0-logloss:0.51600
                                         validation_0-error:0.06639
validation_1-logloss:0.51928
                                 validation_1-error:0.08246
        validation_0-logloss:0.49442
                                         validation 0-error:0.06639
[6]
validation_1-logloss:0.49800
                                 validation_1-error:0.08246
        validation_0-logloss:0.47446
                                         validation_0-error:0.05514
[7]
                                 validation_1-error:0.06297
validation_1-logloss:0.47815
[8]
        validation_0-logloss:0.45552
                                         validation_0-error:0.05439
validation_1-logloss:0.45915
                                 validation 1-error:0.05847
        validation 0-logloss:0.43787
                                         validation 0-error:0.05439
validation 1-logloss:0.44190
                                 validation 1-error:0.05997
        validation 0-logloss:0.42171
                                         validation 0-error:0.05476
validation_1-logloss:0.42654
                                 validation 1-error:0.05997
        validation_0-logloss:0.40621
                                         validation_0-error:0.05401
[11]
validation_1-logloss:0.41120
                                 validation 1-error:0.06597
        validation_0-logloss:0.39171
                                         validation_0-error:0.05401
[12]
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
        validation_0-logloss:0.36519
[14]
                                         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
        validation_0-logloss:0.33193
                                         validation_0-error:0.04876
[17]
validation_1-logloss:0.33927
                                 validation 1-error:0.05547
        validation 0-logloss:0.32201
                                         validation 0-error:0.04801
Г18<sub>]</sub>
validation 1-logloss:0.32957
                                 validation 1-error:0.05397
        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
validation_1-logloss:0.31267
                                 validation_1-error:0.05097
        validation_0-logloss:0.29541
                                         validation_0-error:0.04426
[21]
validation_1-logloss:0.30441
                                 validation_1-error:0.05097
        validation_0-logloss:0.28743
[22]
                                         validation_0-error:0.04314
validation_1-logloss:0.29649
                                 validation 1-error:0.05097
        validation_0-logloss:0.27983
[23]
                                         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
validation 1-logloss:0.27631
                                 validation 1-error:0.05247
        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
validation_1-logloss:0.26505
                                 validation_1-error:0.05397
[28]
        validation_0-logloss:0.24857
                                         validation_0-error:0.04201
validation_1-logloss:0.25969
                                 validation_1-error:0.05397
        validation_0-logloss:0.24283
                                         validation_0-error:0.04163
[29]
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
        validation 0-logloss:0.22375
                                         validation 0-error:0.04013
validation 1-logloss:0.23633
                                 validation 1-error:0.05397
        validation 0-logloss:0.21969
                                         validation 0-error:0.04051
[34]
validation_1-logloss:0.23258
                                 validation 1-error:0.05397
        validation_0-logloss:0.21593
                                         validation_0-error:0.04013
[35]
validation_1-logloss:0.22920
                                 validation 1-error:0.05397
        validation_0-logloss:0.21217
                                         validation_0-error:0.04051
[36]
validation_1-logloss:0.22553
                                 validation_1-error:0.05697
[37]
        validation_0-logloss:0.20874
                                         validation_0-error:0.03864
validation_1-logloss:0.22231
                                 validation 1-error:0.05397
        validation_0-logloss:0.20537
[38]
                                         validation_0-error:0.03864
validation_1-logloss:0.21918
                                 validation_1-error:0.05397
[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
        validation_0-logloss:0.19613
                                         validation_0-error:0.03676
[41]
validation_1-logloss:0.21013
                                 validation 1-error:0.05547
[42]
        validation 0-logloss:0.19309
                                         validation 0-error:0.03713
validation 1-logloss:0.20636
                                 validation 1-error:0.05247
        validation 0-logloss:0.19069
                                         validation 0-error:0.03638
validation_1-logloss:0.20449
                                 validation 1-error:0.05097
[44]
        validation_0-logloss:0.18811
                                         validation 0-error:0.03601
validation_1-logloss:0.20250
                                 validation_1-error:0.05247
        validation_0-logloss:0.18547
                                         validation_0-error:0.03601
[45]
validation_1-logloss:0.19980
                                 validation_1-error:0.05547
        validation_0-logloss:0.18335
[46]
                                         validation_0-error:0.03488
validation_1-logloss:0.19775
                                 validation_1-error:0.05397
        validation_0-logloss:0.18118
[47]
                                         validation_0-error:0.03488
validation_1-logloss:0.19579
                                 validation_1-error:0.05247
[48]
        validation_0-logloss:0.17898
                                         validation_0-error:0.03526
validation_1-logloss:0.19333
                                 validation_1-error:0.04947
[49]
        validation_0-logloss:0.17688
                                         validation_0-error:0.03526
validation 1-logloss:0.19160
                                 validation 1-error:0.05097
        validation_0-logloss:0.65600
                                         validation 0-error:0.07127
validation 1-logloss:0.65724
                                 validation 1-error:0.09145
        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
        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
        validation_0-logloss:0.51505
                                         validation_0-error:0.07127
[5]
validation_1-logloss:0.52056
                                 validation_1-error:0.08846
[6]
        validation_0-logloss:0.49352
                                         validation_0-error:0.07127
validation_1-logloss:0.50012
                                 validation 1-error:0.08846
        validation 0-logloss:0.47330
                                         validation 0-error:0.07089
validation 1-logloss:0.48052
                                 validation 1-error:0.08846
        validation 0-logloss:0.45494
                                         validation 0-error:0.07089
validation_1-logloss:0.46318
                                 validation 1-error:0.08846
        validation_0-logloss:0.43762
                                         validation_0-error:0.07089
[9]
validation_1-logloss:0.44640
                                 validation 1-error:0.08846
        validation_0-logloss:0.42183
                                         validation_0-error:0.07089
[10]
validation_1-logloss:0.43162
                                 validation_1-error:0.08846
[11]
        validation_0-logloss:0.40661
                                         validation_0-error:0.07089
validation_1-logloss:0.41690
                                 validation 1-error:0.09145
        validation_0-logloss:0.39279
[12]
                                         validation_0-error:0.07089
validation_1-logloss:0.40372
                                 validation_1-error:0.09145
[13]
        validation_0-logloss:0.37958
                                         validation_0-error:0.07052
validation_1-logloss:0.39076
                                 validation_1-error:0.09145
```

```
[14]
        validation_0-logloss:0.36749
                                         validation_0-error:0.06977
validation_1-logloss:0.37917
                                 validation_1-error:0.09145
        validation_0-logloss:0.35601
[15]
                                         validation_0-error:0.05851
validation_1-logloss:0.36811
                                 validation 1-error:0.07196
        validation 0-logloss:0.34464
                                         validation 0-error:0.05701
Г16<sub>]</sub>
validation 1-logloss:0.35673
                                 validation 1-error:0.07346
        validation 0-logloss:0.33419
                                         validation 0-error:0.05701
validation_1-logloss:0.34626
                                 validation 1-error:0.07346
        validation_0-logloss:0.32429
                                         validation 0-error:0.05476
[18]
validation_1-logloss:0.33632
                                 validation_1-error:0.07196
        validation_0-logloss:0.31505
[19]
                                         validation_0-error:0.05589
validation_1-logloss:0.32676
                                 validation_1-error:0.07346
        validation_0-logloss:0.30542
[20]
                                         validation_0-error:0.05439
validation_1-logloss:0.31766
                                 validation 1-error:0.07196
        validation_0-logloss:0.29653
[21]
                                         validation_0-error:0.05401
validation_1-logloss:0.30927
                                 validation_1-error:0.07046
[22]
        validation_0-logloss:0.28834
                                         validation_0-error:0.05401
validation_1-logloss:0.30129
                                 validation_1-error:0.07046
[23]
        validation_0-logloss:0.28067
                                         validation_0-error:0.05439
validation 1-logloss:0.29414
                                 validation 1-error:0.07046
                                         validation 0-error:0.05251
        validation_0-logloss:0.27344
validation 1-logloss:0.28699
                                 validation 1-error:0.07046
[25]
        validation_0-logloss:0.26659
                                         validation_0-error:0.05251
validation_1-logloss:0.28075
                                 validation_1-error:0.07046
[26]
        validation_0-logloss:0.26030
                                         validation_0-error:0.04951
validation_1-logloss:0.27468
                                 validation_1-error:0.06297
[27]
        validation_0-logloss:0.25450
                                         validation_0-error:0.04989
validation_1-logloss:0.26879
                                 validation_1-error:0.06297
[28]
        validation_0-logloss:0.24882
                                         validation 0-error:0.04876
validation_1-logloss:0.26368
                                 validation_1-error:0.06297
[29]
        validation_0-logloss:0.24354
                                         validation_0-error:0.04839
validation_1-logloss:0.25865
                                 validation_1-error:0.06147
[30]
        validation_0-logloss:0.23873
                                         validation_0-error:0.04464
validation_1-logloss:0.25447
                                 validation 1-error:0.06297
        validation 0-logloss:0.23403
                                         validation 0-error:0.04239
validation 1-logloss:0.25005
                                 validation 1-error:0.05997
        validation 0-logloss:0.22954
                                         validation 0-error:0.04163
[32]
validation_1-logloss:0.24580
                                 validation 1-error:0.06147
        validation_0-logloss:0.22554
                                         validation_0-error:0.04088
[33]
validation_1-logloss:0.24242
                                 validation 1-error:0.05997
        validation_0-logloss:0.22159
                                         validation_0-error:0.04051
[34]
validation_1-logloss:0.23898
                                 validation_1-error:0.05697
[35]
        validation_0-logloss:0.21776
                                         validation_0-error:0.04051
validation_1-logloss:0.23507
                                 validation 1-error:0.05697
        validation_0-logloss:0.21411
[36]
                                         validation_0-error:0.04051
validation_1-logloss:0.23179
                                 validation_1-error:0.05697
[37]
        validation_0-logloss:0.21084
                                         validation_0-error:0.04013
validation_1-logloss:0.22856
                                 validation_1-error:0.05697
```

```
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
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)
[39]
        validation_0-logloss:0.20461
                                        validation_0-error:0.04013
validation_1-logloss:0.22282
                                validation_1-error:0.05547
        validation_0-logloss:0.20187
                                        validation_0-error:0.03939
validation_1-logloss:0.22050
                                validation 1-error:0.05547
        validation 0-logloss:0.19913
                                         validation 0-error:0.03939
[41]
validation 1-logloss:0.21802
                                validation 1-error:0.05547
        validation 0-logloss:0.19652
[42]
                                         validation 0-error:0.03939
validation_1-logloss:0.21586
                                validation_1-error:0.05547
        validation_0-logloss:0.19407
                                         validation_0-error:0.04051
[43]
validation_1-logloss:0.21354
                                validation_1-error:0.05397
        validation_0-logloss:0.19184
[44]
                                         validation_0-error:0.03939
validation_1-logloss:0.21123
                                validation_1-error:0.05547
        validation_0-logloss:0.18973
                                        validation_0-error:0.03939
validation_1-logloss:0.20944
                                validation 1-error:0.05547
[46]
        validation_0-logloss:0.18741
                                         validation_0-error:0.03976
validation_1-logloss:0.20742
                                validation_1-error:0.05547
        validation_0-logloss:0.18535
                                         validation_0-error:0.03976
validation_1-logloss:0.20565
                                validation_1-error:0.05397
        validation_0-logloss:0.18309
                                         validation_0-error:0.03976
[48]
validation 1-logloss:0.20416
                                validation 1-error:0.05397
[49]
        validation_0-logloss:0.18136
                                         validation 0-error:0.03901
validation 1-logloss:0.20250
                                validation 1-error:0.05397
        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
        validation_0-logloss:0.59312
                                         validation_0-error:0.06977
[2]
validation_1-logloss:0.59544
                                validation_1-error:0.08846
        validation_0-logloss:0.56551
                                         validation_0-error:0.06789
validation_1-logloss:0.56873
                                validation_1-error:0.08546
        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_0-error:0.03976

[38]

validation_0-logloss:0.20768

```
validation_1-logloss:0.52120
                                 validation_1-error:0.08546
        validation_0-logloss:0.49530
                                         validation_0-error:0.05664
[6]
validation_1-logloss:0.50006
                                 validation_1-error:0.06597
[7]
        validation_0-logloss:0.47549
                                         validation_0-error:0.05664
validation 1-logloss:0.48077
                                 validation 1-error:0.06597
        validation 0-logloss:0.45711
                                         validation 0-error:0.05664
validation 1-logloss:0.46288
                                 validation 1-error:0.06597
[9]
        validation_0-logloss:0.44010
                                         validation 0-error:0.05664
validation 1-logloss:0.44638
                                 validation 1-error:0.06597
                                         validation_0-error:0.05626
[10]
        validation_0-logloss:0.42426
validation_1-logloss:0.43083
                                 validation_1-error:0.06597
[11]
        validation_0-logloss:0.40960
                                         validation_0-error:0.05626
validation_1-logloss:0.41696
                                 validation_1-error:0.06597
        validation_0-logloss:0.39566
                                         validation_0-error:0.05626
[12]
validation_1-logloss:0.40292
                                 validation_1-error:0.06597
[13]
        validation_0-logloss:0.38262
                                         validation_0-error:0.05551
validation_1-logloss:0.39058
                                 validation_1-error:0.06597
        validation_0-logloss:0.36938
                                         validation_0-error:0.05551
validation_1-logloss:0.37747
                                 validation 1-error:0.06597
Γ15]
        validation 0-logloss:0.35702
                                         validation 0-error:0.05551
validation 1-logloss:0.36533
                                 validation 1-error:0.06597
        validation 0-logloss:0.34544
[16]
                                         validation 0-error:0.05551
validation_1-logloss:0.35374
                                 validation_1-error:0.06597
        validation_0-logloss:0.33464
                                         validation_0-error:0.05589
[17]
validation_1-logloss:0.34352
                                 validation_1-error:0.06747
        validation_0-logloss:0.32461
                                         validation_0-error:0.05551
[18]
validation_1-logloss:0.33363
                                 validation_1-error:0.06747
        validation_0-logloss:0.31518
[19]
                                         validation_0-error:0.05514
validation_1-logloss:0.32474
                                 validation 1-error:0.06897
[20]
        validation_0-logloss:0.30631
                                         validation_0-error:0.05514
validation_1-logloss:0.31585
                                 validation_1-error:0.06897
        validation_0-logloss:0.29760
[21]
                                         validation_0-error:0.05439
validation_1-logloss:0.30752
                                 validation_1-error:0.06597
[22]
        validation_0-logloss:0.28952
                                         validation_0-error:0.04839
validation 1-logloss:0.29954
                                 validation 1-error:0.06147
        validation 0-logloss:0.28192
[23]
                                         validation 0-error:0.04539
validation 1-logloss:0.29195
                                 validation 1-error:0.05847
Γ241
        validation_0-logloss:0.27477
                                         validation 0-error:0.04539
validation_1-logloss:0.28516
                                 validation_1-error:0.05847
        validation_0-logloss:0.26789
[25]
                                         validation_0-error:0.04501
validation_1-logloss:0.27868
                                 validation_1-error:0.05697
        validation_0-logloss:0.26153
                                         validation_0-error:0.04389
[26]
validation_1-logloss:0.27269
                                 validation_1-error:0.05697
        validation_0-logloss:0.25541
                                         validation_0-error:0.04351
[27]
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
        validation_0-logloss:0.23428
                                         validation 0-error:0.04239
[31]
validation 1-logloss:0.24652
                                 validation 1-error:0.05547
[32]
        validation 0-logloss:0.22982
                                         validation 0-error:0.04239
                                 validation_1-error:0.05697
validation 1-logloss:0.24230
[33]
        validation_0-logloss:0.22560
                                         validation_0-error:0.04276
validation 1-logloss:0.23813
                                 validation 1-error:0.05697
                                         validation_0-error:0.04201
[34]
        validation_0-logloss:0.22154
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
        validation_0-logloss:0.21387
                                         validation_0-error:0.04201
[36]
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
        validation 0-logloss:0.20110
[40]
                                         validation 0-error:0.03976
validation_1-logloss:0.21456
                                 validation_1-error:0.05247
        validation 0-logloss:0.19834
                                         validation_0-error:0.03939
[41]
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
        validation_0-logloss:0.19300
[43]
                                         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
        validation_0-logloss:0.18830
[45]
                                         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
        validation 0-logloss:0.18350
[47]
                                         validation 0-error:0.03788
validation 1-logloss:0.19772
                                 validation 1-error:0.04947
۲481
        validation_0-logloss:0.18100
                                         validation 0-error:0.03751
validation_1-logloss:0.19472
                                 validation_1-error:0.05097
        validation_0-logloss:0.17932
[49]
                                         validation_0-error:0.03676
validation_1-logloss:0.19365
                                 validation_1-error:0.05097
        validation_0-logloss:0.65660
                                         validation_0-error:0.07277
[0]
validation_1-logloss:0.65761
                                 validation_1-error:0.08546
        validation_0-logloss:0.62351
                                         validation_0-error:0.05889
[1]
validation_1-logloss:0.62520
                                 validation_1-error:0.06897
        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
        validation_0-logloss:0.54028
                                         validation_0-error:0.05851
[4]
validation_1-logloss:0.54405
                                 validation_1-error:0.06897
        validation_0-logloss:0.51705
                                         validation_0-error:0.05889
[5]
validation 1-logloss:0.52141
                                 validation 1-error:0.06897
        validation 0-logloss:0.49546
                                         validation 0-error:0.05851
                                 validation_1-error:0.06897
validation 1-logloss:0.50043
[7]
        validation_0-logloss:0.47571
                                         validation_0-error:0.05851
validation 1-logloss:0.48110
                                 validation 1-error:0.06897
                                         validation_0-error:0.05851
        validation_0-logloss:0.45725
validation_1-logloss:0.46312
                                 validation_1-error:0.06897
[9]
        validation_0-logloss:0.44024
                                         validation_0-error:0.05851
validation_1-logloss:0.44673
                                 validation_1-error:0.06897
        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
validation_1-logloss:0.41709
                                 validation_1-error:0.06897
[12]
        validation_0-logloss:0.39581
                                         validation_0-error:0.05664
validation_1-logloss:0.40411
                                 validation 1-error:0.07046
Γ13]
        validation 0-logloss:0.38299
                                         validation 0-error:0.05664
validation 1-logloss:0.39141
                                 validation 1-error:0.07046
        validation 0-logloss:0.37100
[14]
                                         validation 0-error:0.05664
validation_1-logloss:0.38021
                                 validation_1-error:0.07046
        validation 0-logloss:0.35988
                                         validation_0-error:0.05664
[15]
validation_1-logloss:0.36957
                                 validation_1-error:0.07046
        validation_0-logloss:0.34820
                                         validation_0-error:0.05626
[16]
validation_1-logloss:0.35758
                                 validation_1-error:0.07046
        validation_0-logloss:0.33723
[17]
                                         validation_0-error:0.05626
validation_1-logloss:0.34653
                                 validation 1-error:0.07046
[18]
        validation_0-logloss:0.32702
                                         validation_0-error:0.05476
validation_1-logloss:0.33613
                                 validation_1-error:0.06747
        validation_0-logloss:0.31710
[19]
                                         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
        validation 0-logloss:0.29898
[21]
                                         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
        validation_0-logloss:0.28295
[23]
                                         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
validation_1-logloss:0.28654
                                 validation_1-error:0.06297
[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
```

```
validation_1-logloss:0.26737
                                validation_1-error:0.05847
        validation_0-logloss:0.25057
                                         validation_0-error:0.04389
[28]
validation_1-logloss:0.26215
                                validation_1-error:0.05547
[29]
        validation 0-logloss:0.24520
                                         validation 0-error:0.04201
validation 1-logloss:0.25676
                                validation 1-error:0.05547
        validation 0-logloss:0.24012
                                         validation 0-error:0.04239
[30]
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
validation_1-logloss:0.24277
                                validation_1-error:0.05247
        validation_0-logloss:0.22665
                                         validation_0-error:0.04013
[33]
validation_1-logloss:0.23872
                                validation_1-error:0.04947
        validation_0-logloss:0.22243
                                        validation 0-error:0.04013
validation_1-logloss:0.23467
                                validation_1-error:0.04947
        validation_0-logloss:0.21867
                                         validation_0-error:0.04013
[35]
validation_1-logloss:0.23132
                                validation_1-error:0.04947
        validation_0-logloss:0.21443
                                         validation_0-error:0.03901
[36]
validation 1-logloss:0.22645
                                validation 1-error:0.04798
[37]
        validation 0-logloss:0.21108
                                         validation 0-error:0.03788
validation 1-logloss:0.22352
                                validation 1-error:0.04798
        validation 0-logloss:0.20779
[38]
                                         validation 0-error:0.03788
validation_1-logloss:0.21986
                                validation_1-error:0.04648
        validation_0-logloss:0.20456
                                         validation_0-error:0.03826
[39]
validation_1-logloss:0.21682
                                validation_1-error:0.04798
        validation_0-logloss:0.20171
[40]
                                         validation_0-error:0.03788
validation_1-logloss:0.21441
                                validation_1-error:0.04648
        validation_0-logloss:0.19841
[41]
                                         validation_0-error:0.03713
                                validation_1-error:0.04348
validation_1-logloss:0.21052
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
validation_1-logloss:0.20031
                                 validation_1-error:0.04348
        validation_0-logloss:0.18526
[46]
                                         validation_0-error:0.03526
validation_1-logloss:0.19755
                                 validation 1-error:0.04348
        validation 0-logloss:0.18284
                                         validation 0-error:0.03526
[47]
validation 1-logloss:0.19452
                                 validation 1-error:0.04348
        validation 0-logloss:0.18089
                                         validation 0-error:0.03488
validation_1-logloss:0.19283
                                 validation 1-error:0.04498
[49]
        validation_0-logloss:0.17875
                                         validation 0-error:0.03488
validation_1-logloss:0.19091
                                 validation_1-error:0.04498
        validation_0-logloss:0.17659
                                         validation_0-error:0.03488
[50]
validation_1-logloss:0.18861
                                 validation_1-error:0.04348
        validation_0-logloss:0.17471
[51]
                                         validation_0-error:0.03526
validation_1-logloss:0.18696
                                 validation 1-error:0.04348
        validation_0-logloss:0.17282
[52]
                                         validation_0-error:0.03488
validation_1-logloss:0.18448
                                 validation_1-error:0.04348
[53]
        validation_0-logloss:0.17106
                                         validation_0-error:0.03488
validation_1-logloss:0.18295
                                 validation_1-error:0.04048
[54]
        validation_0-logloss:0.16928
                                         validation_0-error:0.03526
validation 1-logloss:0.18091
                                 validation 1-error:0.03898
        validation_0-logloss:0.16761
                                         validation 0-error:0.03488
validation 1-logloss:0.17945
                                 validation 1-error:0.04048
[56]
        validation_0-logloss:0.16630
                                         validation_0-error:0.03488
validation_1-logloss:0.17847
                                 validation_1-error:0.04198
[57]
        validation_0-logloss:0.16503
                                         validation_0-error:0.03413
validation_1-logloss:0.17715
                                 validation_1-error:0.04048
        validation_0-logloss:0.16382
                                         validation_0-error:0.03413
[58]
validation_1-logloss:0.17645
                                 validation_1-error:0.04048
[59]
        validation_0-logloss:0.16232
                                         validation_0-error:0.03376
validation_1-logloss:0.17444
                                 validation_1-error:0.03898
[60]
        validation_0-logloss:0.16120
                                         validation_0-error:0.03413
validation_1-logloss:0.17365
                                 validation_1-error:0.03748
[61]
        validation_0-logloss:0.15983
                                         validation_0-error:0.03338
validation_1-logloss:0.17180
                                 validation 1-error:0.03748
        validation 0-logloss:0.15873
                                         validation 0-error:0.03338
validation 1-logloss:0.17120
                                 validation 1-error:0.03748
        validation 0-logloss:0.15754
                                         validation 0-error:0.03338
[63]
validation_1-logloss:0.16954
                                 validation 1-error:0.03598
        validation_0-logloss:0.15660
                                         validation_0-error:0.03301
[64]
validation_1-logloss:0.16865
                                 validation 1-error:0.03748
        validation_0-logloss:0.15551
                                         validation_0-error:0.03338
[65]
validation_1-logloss:0.16726
                                 validation_1-error:0.03598
[66]
        validation_0-logloss:0.15449
                                         validation_0-error:0.03338
validation_1-logloss:0.16655
                                 validation 1-error:0.03598
        validation_0-logloss:0.15354
[67]
                                         validation_0-error:0.03301
validation_1-logloss:0.16563
                                 validation_1-error:0.03598
[68]
        validation_0-logloss:0.15267
                                         validation_0-error:0.03263
validation_1-logloss:0.16470
                                 validation_1-error:0.03598
```

```
[69]
        validation_0-logloss:0.15201
                                         validation_0-error:0.03226
validation_1-logloss:0.16424
                                 validation_1-error:0.03598
        validation_0-logloss:0.15091
                                         validation_0-error:0.03113
[70]
validation_1-logloss:0.16286
                                 validation 1-error:0.03298
        validation 0-logloss:0.14993
                                         validation 0-error:0.03113
[71]
validation 1-logloss:0.16206
                                 validation 1-error:0.03148
        validation 0-logloss:0.14948
                                         validation 0-error:0.03113
validation_1-logloss:0.16152
                                 validation 1-error:0.03298
[73]
        validation_0-logloss:0.14888
                                         validation 0-error:0.03113
validation_1-logloss:0.16121
                                 validation_1-error:0.03148
[74]
        validation_0-logloss:0.14841
                                         validation_0-error:0.03113
validation_1-logloss:0.16084
                                 validation_1-error:0.03148
        validation_0-logloss:0.65635
[0]
                                         validation_0-error:0.07164
validation_1-logloss:0.65721
                                 validation 1-error:0.09145
        validation_0-logloss:0.62301
[1]
                                         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
        validation 0-logloss:0.53949
                                         validation 0-error:0.05326
validation 1-logloss:0.54207
                                 validation 1-error:0.06597
        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
        validation_0-logloss:0.47437
                                         validation_0-error:0.05251
[7]
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-error:0.05397
validation_1-logloss:0.44395
        validation_0-logloss:0.42282
[10]
                                         validation_0-error:0.05251
validation 1-logloss:0.42863
                                 validation 1-error:0.05397
        validation 0-logloss:0.40796
                                         validation 0-error:0.05251
validation 1-logloss:0.41410
                                 validation 1-error:0.05397
[12]
        validation 0-logloss:0.39412
                                         validation 0-error:0.05251
validation_1-logloss:0.40060
                                 validation 1-error:0.05397
        validation_0-logloss:0.38123
                                         validation_0-error:0.05251
[13]
validation_1-logloss:0.38834
                                 validation 1-error:0.05397
        validation_0-logloss:0.36919
                                         validation_0-error:0.05251
[14]
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
        validation_0-logloss:0.34634
[16]
                                         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
```

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Γ187
        validation_0-logloss:0.32619
                                         validation_0-error:0.05364
validation_1-logloss:0.33253
                                 validation_1-error:0.05697
        validation_0-logloss:0.31621
                                         validation_0-error:0.05364
[19]
validation_1-logloss:0.32277
                                 validation 1-error:0.05547
        validation 0-logloss:0.30685
                                         validation 0-error:0.05401
[20]
validation 1-logloss:0.31383
                                 validation 1-error:0.05847
        validation 0-logloss:0.29816
                                         validation 0-error:0.05401
validation_1-logloss:0.30530
                                 validation 1-error:0.05847
[22]
        validation_0-logloss:0.28995
                                         validation 0-error:0.05326
validation_1-logloss:0.29697
                                 validation_1-error:0.05697
        validation_0-logloss:0.28238
[23]
                                         validation_0-error:0.05289
validation_1-logloss:0.28959
                                 validation_1-error:0.05397
        validation_0-logloss:0.27520
[24]
                                         validation_0-error:0.05326
validation_1-logloss:0.28299
                                 validation_1-error:0.05547
        validation_0-logloss:0.26848
[25]
                                         validation_0-error:0.05289
validation_1-logloss:0.27616
                                 validation_1-error:0.05397
                                         validation_0-error:0.05289
[26]
        validation_0-logloss:0.26228
validation_1-logloss:0.27025
                                 validation_1-error:0.05247
[27]
        validation_0-logloss:0.25627
                                         validation_0-error:0.05139
validation 1-logloss:0.26466
                                 validation 1-error:0.04947
        validation_0-logloss:0.25044
                                         validation 0-error:0.05139
validation 1-logloss:0.25882
                                 validation 1-error:0.04947
        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
        validation_0-logloss:0.23569
                                         validation_0-error:0.04314
[31]
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
        validation 0-logloss:0.21855
                                         validation 0-error:0.04276
validation 1-logloss:0.22869
                                 validation 1-error:0.04798
        validation 0-logloss:0.21435
                                         validation 0-error:0.04239
[36]
validation_1-logloss:0.22373
                                 validation 1-error:0.04798
        validation_0-logloss:0.21097
                                         validation_0-error:0.04239
[37]
validation_1-logloss:0.22071
                                 validation 1-error:0.04798
        validation_0-logloss:0.20745
                                         validation_0-error:0.04088
[38]
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
[40]
        validation_0-logloss:0.20135
                                         validation_0-error:0.04088
validation_1-logloss:0.21103
                                 validation_1-error:0.04648
[41]
        validation_0-logloss:0.19809
                                         validation_0-error:0.04088
validation_1-logloss:0.20724
                                 validation_1-error:0.04648
```

```
[42]
        validation_0-logloss:0.19538
                                         validation_0-error:0.04088
validation_1-logloss:0.20480
                                 validation_1-error:0.04648
        validation_0-logloss:0.19282
[43]
                                         validation_0-error:0.04051
validation_1-logloss:0.20266
                                 validation 1-error:0.04498
        validation 0-logloss:0.19022
                                         validation 0-error:0.03939
Γ441
validation 1-logloss:0.19973
                                 validation 1-error:0.04348
        validation 0-logloss:0.18790
                                         validation 0-error:0.03939
validation_1-logloss:0.19771
                                 validation 1-error:0.04348
[46]
        validation_0-logloss:0.18535
                                         validation 0-error:0.03901
validation_1-logloss:0.19451
                                 validation_1-error:0.04348
        validation_0-logloss:0.18329
                                         validation_0-error:0.03901
[47]
validation_1-logloss:0.19288
                                 validation_1-error:0.04348
        validation_0-logloss:0.18098
[48]
                                         validation_0-error:0.03901
validation_1-logloss:0.19016
                                 validation_1-error:0.04348
        validation_0-logloss:0.17901
[49]
                                         validation_0-error:0.03939
validation_1-logloss:0.18861
                                 validation_1-error:0.04348
[50]
        validation_0-logloss:0.17709
                                         validation_0-error:0.03864
validation_1-logloss:0.18636
                                 validation_1-error:0.04348
[51]
        validation_0-logloss:0.17550
                                         validation_0-error:0.03901
validation 1-logloss:0.18495
                                 validation 1-error:0.04348
                                         validation 0-error:0.03864
        validation_0-logloss:0.17390
validation 1-logloss:0.18339
                                 validation 1-error:0.04348
        validation_0-logloss:0.17223
                                         validation_0-error:0.03826
validation_1-logloss:0.18158
                                 validation 1-error:0.04348
[54]
        validation_0-logloss:0.17064
                                         validation_0-error:0.03826
validation_1-logloss:0.17995
                                 validation_1-error:0.04348
        validation_0-logloss:0.16922
                                         validation_0-error:0.03788
[55]
validation_1-logloss:0.17907
                                 validation_1-error:0.04348
[56]
        validation_0-logloss:0.16780
                                         validation_0-error:0.03826
validation_1-logloss:0.17750
                                 validation_1-error:0.04348
[57]
        validation_0-logloss:0.16632
                                         validation_0-error:0.03713
validation_1-logloss:0.17639
                                 validation_1-error:0.04198
[58]
        validation_0-logloss:0.16505
                                         validation_0-error:0.03713
validation_1-logloss:0.17517
                                 validation 1-error:0.04198
        validation 0-logloss:0.16364
                                         validation 0-error:0.03713
validation 1-logloss:0.17399
                                 validation 1-error:0.04198
        validation 0-logloss:0.16243
                                         validation 0-error:0.03638
[60]
validation_1-logloss:0.17303
                                 validation 1-error:0.04198
        validation_0-logloss:0.16115
                                         validation_0-error:0.03563
[61]
validation_1-logloss:0.17214
                                 validation 1-error:0.04198
        validation_0-logloss:0.16005
                                         validation_0-error:0.03638
[62]
validation_1-logloss:0.17123
                                 validation_1-error:0.04198
[63]
        validation_0-logloss:0.15883
                                         validation_0-error:0.03638
validation_1-logloss:0.17086
                                 validation 1-error:0.04198
        validation_0-logloss:0.15804
[64]
                                         validation_0-error:0.03638
validation_1-logloss:0.17028
                                 validation_1-error:0.04198
[65]
        validation_0-logloss:0.15706
                                         validation_0-error:0.03638
validation_1-logloss:0.16933
                                 validation_1-error:0.04198
```

```
[66]
        validation_0-logloss:0.15604
                                         validation_0-error:0.03638
validation_1-logloss:0.16906
                                 validation_1-error:0.04198
        validation_0-logloss:0.15509
                                         validation_0-error:0.03638
[67]
validation_1-logloss:0.16829
                                 validation 1-error:0.04198
        validation 0-logloss:0.15443
                                         validation 0-error:0.03638
[68]
validation 1-logloss:0.16780
                                 validation 1-error:0.04198
        validation 0-logloss:0.15353
                                         validation 0-error:0.03601
                                 validation 1-error:0.04198
validation_1-logloss:0.16695
[70]
        validation_0-logloss:0.15293
                                         validation 0-error:0.03601
validation_1-logloss:0.16646
                                 validation_1-error:0.04048
        validation_0-logloss:0.15213
                                         validation_0-error:0.03601
[71]
validation_1-logloss:0.16605
                                 validation_1-error:0.04048
        validation_0-logloss:0.15145
                                         validation_0-error:0.03601
[72]
validation_1-logloss:0.16570
                                 validation 1-error:0.04048
        validation_0-logloss:0.15087
[73]
                                         validation_0-error:0.03563
validation_1-logloss:0.16501
                                 validation_1-error:0.04048
[74]
        validation_0-logloss:0.15017
                                         validation_0-error:0.03563
validation_1-logloss:0.16470
                                 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
        validation 0-logloss:0.62292
                                         validation 0-error:0.07014
validation 1-logloss:0.62462
                                 validation 1-error:0.08696
        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
        validation_0-logloss:0.53942
                                         validation_0-error:0.06639
[4]
validation_1-logloss:0.54231
                                 validation_1-error:0.08246
        validation_0-logloss:0.51600
[5]
                                         validation 0-error:0.06639
validation_1-logloss:0.51928
                                 validation_1-error:0.08246
        validation_0-logloss:0.49442
                                         validation_0-error:0.06639
[6]
validation_1-logloss:0.49800
                                 validation_1-error:0.08246
        validation_0-logloss:0.47446
[7]
                                         validation_0-error:0.05514
validation_1-logloss:0.47815
                                 validation 1-error:0.06297
        validation 0-logloss:0.45552
                                         validation 0-error:0.05439
validation 1-logloss:0.45915
                                 validation 1-error:0.05847
        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
        validation_0-logloss:0.40621
                                         validation_0-error:0.05401
[11]
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
        validation_0-logloss:0.37809
[13]
                                         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
```

```
validation_1-logloss:0.36017
                                 validation_1-error:0.05697
        validation_0-logloss:0.34257
                                         validation_0-error:0.04801
[16]
validation 1-logloss:0.34921
                                 validation 1-error:0.05547
        validation 0-logloss:0.33193
                                         validation 0-error:0.04876
[17]
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)
Г18<sub>]</sub>
        validation_0-logloss:0.32201
                                         validation 0-error:0.04801
validation 1-logloss:0.32957
                                 validation 1-error:0.05397
        validation 0-logloss:0.31274
[19]
                                         validation 0-error:0.04614
validation_1-logloss:0.32093
                                 validation_1-error:0.05397
        validation 0-logloss:0.30398
                                         validation_0-error:0.04464
[20]
validation_1-logloss:0.31267
                                 validation_1-error:0.05097
        validation_0-logloss:0.29541
[21]
                                         validation_0-error:0.04426
validation_1-logloss:0.30441
                                 validation_1-error:0.05097
        validation_0-logloss:0.28743
[22]
                                         validation_0-error:0.04314
validation_1-logloss:0.29649
                                 validation 1-error:0.05097
[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
        validation_0-logloss:0.26602
                                         validation_0-error:0.04389
[25]
validation 1-logloss:0.27631
                                 validation 1-error:0.05247
        validation 0-logloss:0.25993
[26]
                                         validation 0-error:0.04389
validation 1-logloss:0.27061
                                 validation 1-error:0.05397
        validation_0-logloss:0.25396
                                         validation 0-error:0.04276
[27]
validation_1-logloss:0.26505
                                 validation_1-error:0.05397
[28]
        validation_0-logloss:0.24857
                                         validation_0-error:0.04201
validation_1-logloss:0.25969
                                 validation_1-error:0.05397
        validation_0-logloss:0.24283
                                         validation_0-error:0.04163
[29]
validation_1-logloss:0.25327
                                 validation_1-error:0.05097
        validation_0-logloss:0.23763
[30]
                                         validation_0-error:0.04126
validation_1-logloss:0.24871
                                 validation_1-error:0.05247
        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_0-error:0.04801

[15]

validation_0-logloss:0.35354

```
validation_1-logloss:0.24011
                                 validation_1-error:0.05397
[33]
        validation_0-logloss:0.22375
                                         validation_0-error:0.04013
validation_1-logloss:0.23633
                                 validation_1-error:0.05397
[34]
        validation_0-logloss:0.21969
                                         validation_0-error:0.04051
validation 1-logloss:0.23258
                                 validation 1-error:0.05397
[35]
        validation 0-logloss:0.21593
                                         validation 0-error:0.04013
validation 1-logloss:0.22920
                                 validation 1-error:0.05397
[36]
        validation_0-logloss:0.21217
                                         validation 0-error:0.04051
validation 1-logloss:0.22553
                                 validation 1-error:0.05697
                                         validation_0-error:0.03864
[37]
        validation_0-logloss:0.20874
validation_1-logloss:0.22231
                                 validation_1-error:0.05397
[38]
        validation_0-logloss:0.20537
                                         validation_0-error:0.03864
validation_1-logloss:0.21918
                                 validation_1-error:0.05397
        validation_0-logloss:0.20178
                                         validation_0-error:0.03901
[39]
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
validation 1-logloss:0.20636
                                 validation 1-error:0.05247
        validation 0-logloss:0.19069
                                         validation 0-error:0.03638
[43]
validation_1-logloss:0.20449
                                 validation_1-error:0.05097
        validation_0-logloss:0.18811
                                         validation_0-error:0.03601
[44]
validation_1-logloss:0.20250
                                 validation_1-error:0.05247
[45]
        validation_0-logloss:0.18547
                                         validation_0-error:0.03601
validation_1-logloss:0.19980
                                 validation_1-error:0.05547
        validation_0-logloss:0.18335
[46]
                                         validation_0-error:0.03488
validation_1-logloss:0.19775
                                 validation 1-error:0.05397
[47]
        validation_0-logloss:0.18118
                                         validation_0-error:0.03488
validation_1-logloss:0.19579
                                 validation_1-error:0.05247
[48]
        validation_0-logloss:0.17898
                                         validation_0-error:0.03526
validation_1-logloss:0.19333
                                 validation_1-error:0.04947
[49]
        validation_0-logloss:0.17688
                                         validation_0-error:0.03526
validation 1-logloss:0.19160
                                 validation 1-error:0.05097
        validation 0-logloss:0.17487
[50]
                                         validation 0-error:0.03526
validation 1-logloss:0.18951
                                 validation_1-error:0.05097
[51]
        validation_0-logloss:0.17306
                                         validation 0-error:0.03563
validation_1-logloss:0.18800
                                 validation_1-error:0.05097
        validation_0-logloss:0.17104
[52]
                                         validation 0-error:0.03451
validation_1-logloss:0.18554
                                 validation_1-error:0.04798
        validation_0-logloss:0.16942
                                         validation_0-error:0.03413
[53]
validation_1-logloss:0.18404
                                 validation_1-error:0.04798
        validation_0-logloss:0.16779
                                         validation_0-error:0.03413
[54]
validation_1-logloss:0.18239
                                 validation_1-error:0.04798
[55]
        validation_0-logloss:0.16645
                                         validation_0-error:0.03376
validation_1-logloss:0.18186
                                 validation_1-error:0.04947
[56]
        validation_0-logloss:0.16491
                                         validation_0-error:0.03376
```

```
validation_1-logloss:0.18057
                                 validation_1-error:0.04498
[57]
        validation_0-logloss:0.16321
                                         validation_0-error:0.03376
validation_1-logloss:0.17852
                                 validation_1-error:0.04498
[58]
        validation_0-logloss:0.16180
                                         validation_0-error:0.03376
validation 1-logloss:0.17744
                                 validation 1-error:0.04648
[59]
        validation 0-logloss:0.16032
                                         validation 0-error:0.03376
validation 1-logloss:0.17574
                                 validation 1-error:0.04648
[60]
        validation_0-logloss:0.15895
                                         validation_0-error:0.03376
validation 1-logloss:0.17399
                                 validation 1-error:0.04498
                                         validation_0-error:0.03376
        validation_0-logloss:0.15772
[61]
validation_1-logloss:0.17342
                                 validation_1-error:0.04498
[62]
        validation_0-logloss:0.15643
                                         validation_0-error:0.03226
validation_1-logloss:0.17188
                                 validation_1-error:0.04498
        validation_0-logloss:0.15523
                                         validation_0-error:0.03188
[63]
validation_1-logloss:0.17035
                                 validation_1-error:0.04498
[64]
        validation_0-logloss:0.15419
                                         validation_0-error:0.03226
validation_1-logloss:0.16979
                                 validation_1-error:0.04648
[65]
        validation_0-logloss:0.15305
                                         validation_0-error:0.03226
validation 1-logloss:0.16841
                                 validation 1-error:0.04348
[66]
        validation 0-logloss:0.15226
                                         validation 0-error:0.03226
validation 1-logloss:0.16788
                                 validation 1-error:0.04348
        validation 0-logloss:0.15124
                                         validation 0-error:0.03226
[67]
validation_1-logloss:0.16656
                                 validation 1-error:0.04198
        validation_0-logloss:0.15033
                                         validation 0-error:0.03226
[68]
validation_1-logloss:0.16606
                                 validation_1-error:0.04198
        validation_0-logloss:0.14932
                                         validation_0-error:0.03226
[69]
validation_1-logloss:0.16483
                                 validation_1-error:0.04198
        validation_0-logloss:0.14846
                                         validation_0-error:0.03188
[70]
validation_1-logloss:0.16465
                                 validation 1-error:0.04198
[71]
        validation_0-logloss:0.14763
                                         validation_0-error:0.03151
validation_1-logloss:0.16371
                                 validation_1-error:0.04348
        validation_0-logloss:0.14685
[72]
                                         validation_0-error:0.03113
validation_1-logloss:0.16268
                                 validation_1-error:0.04198
[73]
        validation_0-logloss:0.14626
                                         validation_0-error:0.03151
validation 1-logloss:0.16236
                                 validation 1-error:0.04198
        validation 0-logloss:0.14552
Γ741
                                         validation 0-error:0.03151
validation 1-logloss:0.16145
                                 validation 1-error:0.04198
        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
        validation_0-logloss:0.59182
                                         validation_0-error:0.07127
[2]
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
        validation_0-logloss:0.53854
                                         validation_0-error:0.07127
validation_1-logloss:0.54387
                                 validation_1-error:0.08846
[5]
        validation_0-logloss:0.51505
                                         validation_0-error:0.07127
```

```
validation_1-logloss:0.52056
                                 validation_1-error:0.08846
        validation_0-logloss:0.49352
                                         validation_0-error:0.07127
[6]
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
        validation 0-logloss:0.45494
                                         validation 0-error:0.07089
validation 1-logloss:0.46318
                                 validation 1-error:0.08846
[9]
        validation_0-logloss:0.43762
                                         validation 0-error:0.07089
validation 1-logloss:0.44640
                                 validation 1-error:0.08846
                                         validation_0-error:0.07089
        validation_0-logloss:0.42183
[10]
validation_1-logloss:0.43162
                                 validation_1-error:0.08846
[11]
        validation_0-logloss:0.40661
                                         validation_0-error:0.07089
validation_1-logloss:0.41690
                                 validation_1-error:0.09145
        validation_0-logloss:0.39279
                                         validation_0-error:0.07089
[12]
validation_1-logloss:0.40372
                                 validation_1-error:0.09145
[13]
        validation_0-logloss:0.37958
                                         validation_0-error:0.07052
validation_1-logloss:0.39076
                                 validation_1-error:0.09145
        validation_0-logloss:0.36749
                                         validation_0-error:0.06977
validation_1-logloss:0.37917
                                 validation 1-error:0.09145
Γ15]
        validation 0-logloss:0.35601
                                         validation 0-error:0.05851
validation 1-logloss:0.36811
                                 validation 1-error:0.07196
        validation 0-logloss:0.34464
                                         validation 0-error:0.05701
[16]
validation_1-logloss:0.35673
                                 validation_1-error:0.07346
        validation_0-logloss:0.33419
                                         validation_0-error:0.05701
[17]
validation_1-logloss:0.34626
                                 validation_1-error:0.07346
        validation_0-logloss:0.32429
                                         validation_0-error:0.05476
[18]
validation_1-logloss:0.33632
                                 validation_1-error:0.07196
        validation_0-logloss:0.31505
                                         validation_0-error:0.05589
[19]
validation_1-logloss:0.32676
                                 validation 1-error:0.07346
[20]
        validation_0-logloss:0.30542
                                         validation_0-error:0.05439
validation_1-logloss:0.31766
                                 validation_1-error:0.07196
        validation_0-logloss:0.29653
[21]
                                         validation_0-error:0.05401
validation_1-logloss:0.30927
                                 validation_1-error:0.07046
[22]
        validation_0-logloss:0.28834
                                         validation_0-error:0.05401
validation 1-logloss:0.30129
                                 validation 1-error:0.07046
        validation 0-logloss:0.28067
[23]
                                         validation 0-error:0.05439
validation 1-logloss:0.29414
                                 validation 1-error:0.07046
Γ241
        validation_0-logloss:0.27344
                                         validation 0-error:0.05251
validation_1-logloss:0.28699
                                 validation_1-error:0.07046
        validation_0-logloss:0.26659
                                         validation 0-error:0.05251
[25]
validation_1-logloss:0.28075
                                 validation_1-error:0.07046
        validation_0-logloss:0.26030
[26]
                                         validation_0-error:0.04951
validation_1-logloss:0.27468
                                 validation_1-error:0.06297
        validation_0-logloss:0.25450
                                         validation_0-error:0.04989
[27]
validation_1-logloss:0.26879
                                 validation_1-error:0.06297
[28]
        validation_0-logloss:0.24882
                                         validation_0-error:0.04876
validation_1-logloss:0.26368
                                 validation_1-error:0.06297
[29]
        validation_0-logloss:0.24354
                                         validation_0-error:0.04839
```

```
validation_1-logloss:0.25865
                                 validation_1-error:0.06147
[30]
        validation_0-logloss:0.23873
                                         validation_0-error:0.04464
validation_1-logloss:0.25447
                                 validation_1-error:0.06297
        validation_0-logloss:0.23403
                                         validation_0-error:0.04239
[31]
validation 1-logloss:0.25005
                                 validation 1-error:0.05997
[32]
        validation 0-logloss:0.22954
                                         validation 0-error:0.04163
validation 1-logloss:0.24580
                                 validation 1-error:0.06147
[33]
        validation_0-logloss:0.22554
                                         validation 0-error:0.04088
validation 1-logloss:0.24242
                                 validation 1-error:0.05997
                                         validation_0-error:0.04051
[34]
        validation_0-logloss:0.22159
validation_1-logloss:0.23898
                                 validation_1-error:0.05697
[35]
        validation_0-logloss:0.21776
                                         validation_0-error:0.04051
validation_1-logloss:0.23507
                                 validation_1-error:0.05697
        validation_0-logloss:0.21411
                                         validation_0-error:0.04051
[36]
validation_1-logloss:0.23179
                                 validation_1-error:0.05697
[37]
        validation_0-logloss:0.21084
                                         validation_0-error:0.04013
validation_1-logloss:0.22856
                                 validation_1-error:0.05697
[38]
        validation_0-logloss:0.20768
                                         validation_0-error:0.03976
validation_1-logloss:0.22561
                                 validation 1-error:0.05697
[39]
        validation 0-logloss:0.20461
                                         validation 0-error:0.04013
validation 1-logloss:0.22282
                                 validation 1-error:0.05547
        validation 0-logloss:0.20187
                                         validation 0-error:0.03939
[40]
validation_1-logloss:0.22050
                                 validation_1-error:0.05547
        validation 0-logloss:0.19913
                                         validation_0-error:0.03939
[41]
validation_1-logloss:0.21802
                                 validation_1-error:0.05547
[42]
        validation_0-logloss:0.19652
                                         validation_0-error:0.03939
validation_1-logloss:0.21586
                                 validation_1-error:0.05547
        validation_0-logloss:0.19407
[43]
                                         validation_0-error:0.04051
validation_1-logloss:0.21354
                                 validation 1-error:0.05397
[44]
        validation_0-logloss:0.19184
                                         validation_0-error:0.03939
validation_1-logloss:0.21123
                                 validation_1-error:0.05547
[45]
        validation_0-logloss:0.18973
                                         validation_0-error:0.03939
validation_1-logloss:0.20944
                                 validation_1-error:0.05547
[46]
        validation_0-logloss:0.18741
                                         validation_0-error:0.03976
validation 1-logloss:0.20742
                                 validation 1-error:0.05547
        validation 0-logloss:0.18535
[47]
                                         validation 0-error:0.03976
validation 1-logloss:0.20565
                                 validation 1-error:0.05397
۲481
        validation_0-logloss:0.18309
                                         validation 0-error:0.03976
validation_1-logloss:0.20416
                                 validation_1-error:0.05397
        validation_0-logloss:0.18136
                                         validation_0-error:0.03901
[49]
validation_1-logloss:0.20250
                                 validation_1-error:0.05397
        validation_0-logloss:0.17930
[50]
                                         validation_0-error:0.03939
validation_1-logloss:0.20093
                                 validation_1-error:0.05247
        validation_0-logloss:0.17721
                                         validation_0-error:0.03826
[51]
validation_1-logloss:0.19861
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17546
                                         validation_0-error:0.03864
validation_1-logloss:0.19699
                                 validation_1-error:0.05097
[53]
        validation_0-logloss:0.17358
                                         validation_0-error:0.03864
```

```
validation_1-logloss:0.19459
                                 validation_1-error:0.05097
[54]
        validation_0-logloss:0.17196
                                         validation_0-error:0.03751
validation_1-logloss:0.19310
                                 validation_1-error:0.05097
        validation_0-logloss:0.17064
                                         validation_0-error:0.03751
[55]
validation 1-logloss:0.19164
                                 validation 1-error:0.05097
[56]
        validation 0-logloss:0.16921
                                         validation 0-error:0.03713
validation 1-logloss:0.19037
                                 validation 1-error:0.05097
        validation_0-logloss:0.16765
[57]
                                         validation 0-error:0.03713
validation 1-logloss:0.18860
                                 validation 1-error:0.05097
                                         validation_0-error:0.03713
        validation_0-logloss:0.16621
[58]
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
[59]
        validation_0-logloss:0.16480
                                         validation_0-error:0.03713
validation_1-logloss:0.18617
                                 validation_1-error:0.05097
        validation_0-logloss:0.16348
                                         validation_0-error:0.03676
[60]
validation_1-logloss:0.18509
                                 validation_1-error:0.05097
[61]
        validation_0-logloss:0.16223
                                         validation_0-error:0.03676
validation_1-logloss:0.18418
                                 validation_1-error:0.05097
[62]
        validation_0-logloss:0.16110
                                         validation_0-error:0.03638
validation_1-logloss:0.18267
                                 validation 1-error:0.05097
Γ631
        validation 0-logloss:0.15998
                                         validation 0-error:0.03676
validation 1-logloss:0.18175
                                 validation 1-error:0.04947
        validation 0-logloss:0.15883
                                         validation 0-error:0.03601
[64]
validation_1-logloss:0.18082
                                 validation 1-error:0.04798
        validation_0-logloss:0.15795
                                         validation_0-error:0.03563
[65]
validation_1-logloss:0.18012
                                 validation_1-error:0.04798
        validation_0-logloss:0.15687
                                         validation_0-error:0.03601
[66]
validation_1-logloss:0.17883
                                 validation_1-error:0.04798
        validation_0-logloss:0.15609
                                         validation_0-error:0.03488
[67]
validation_1-logloss:0.17856
                                 validation 1-error:0.04798
[68]
        validation_0-logloss:0.15507
                                         validation_0-error:0.03488
validation_1-logloss:0.17725
                                 validation_1-error:0.04798
        validation_0-logloss:0.15429
[69]
                                         validation_0-error:0.03488
validation_1-logloss:0.17697
                                 validation_1-error:0.04798
[70]
        validation_0-logloss:0.15332
                                         validation_0-error:0.03526
validation 1-logloss:0.17599
                                 validation 1-error:0.04798
        validation 0-logloss:0.15267
[71]
                                         validation 0-error:0.03488
                                 validation_1-error:0.04798
validation 1-logloss:0.17570
[72]
        validation_0-logloss:0.15174
                                         validation 0-error:0.03451
validation_1-logloss:0.17435
                                 validation_1-error:0.04798
        validation_0-logloss:0.15083
                                         validation 0-error:0.03451
[73]
validation_1-logloss:0.17309
                                 validation_1-error:0.04798
        validation_0-logloss:0.15016
[74]
                                         validation_0-error:0.03451
validation_1-logloss:0.17284
                                 validation_1-error:0.04798
[0]
        validation_0-logloss:0.65651
                                         validation_0-error:0.07277
validation_1-logloss:0.65742
                                 validation_1-error:0.08995
        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_0-logloss:0.56551
                                        validation_0-error:0.06789
[3]
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
        validation 0-logloss:0.49530
                                         validation 0-error:0.05664
validation 1-logloss:0.50006
                                validation 1-error:0.06597
        validation_0-logloss:0.47549
                                         validation_0-error:0.05664
validation_1-logloss:0.48077
                                validation 1-error:0.06597
[8]
        validation_0-logloss:0.45711
                                        validation_0-error:0.05664
validation_1-logloss:0.46288
                                validation_1-error:0.06597
        validation_0-logloss:0.44010
                                         validation_0-error:0.05664
validation_1-logloss:0.44638
                                validation_1-error:0.06597
        validation_0-logloss:0.42426
[10]
                                         validation_0-error:0.05626
validation_1-logloss:0.43083
                                validation_1-error:0.06597
        validation_0-logloss:0.40960
                                         validation_0-error:0.05626
[11]
validation_1-logloss:0.41696
                                validation_1-error:0.06597
[12]
        validation_0-logloss:0.39566
                                         validation_0-error:0.05626
validation 1-logloss:0.40292
                                validation 1-error:0.06597
        validation 0-logloss:0.38262
                                         validation 0-error:0.05551
validation 1-logloss:0.39058
                                validation 1-error:0.06597
        validation 0-logloss:0.36938
                                         validation 0-error:0.05551
validation_1-logloss:0.37747
                                validation 1-error:0.06597
        validation_0-logloss:0.35702
                                         validation_0-error:0.05551
[15]
validation_1-logloss:0.36533
                                validation 1-error:0.06597
        validation_0-logloss:0.34544
                                         validation_0-error:0.05551
[16]
validation_1-logloss:0.35374
                                validation_1-error:0.06597
        validation_0-logloss:0.33464
                                         validation_0-error:0.05589
[17]
validation_1-logloss:0.34352
                                validation 1-error:0.06747
[18]
        validation_0-logloss:0.32461
                                        validation_0-error:0.05551
validation_1-logloss:0.33363
                                validation_1-error:0.06747
[19]
        validation_0-logloss:0.31518
                                        validation_0-error:0.05514
validation_1-logloss:0.32474
                                validation_1-error:0.06897
```

validation_1-error:0.08846

validation_1-logloss:0.59544

```
[20]
        validation_0-logloss:0.30631
                                         validation_0-error:0.05514
validation_1-logloss:0.31585
                                 validation_1-error:0.06897
        validation_0-logloss:0.29760
                                         validation_0-error:0.05439
[21]
validation_1-logloss:0.30752
                                 validation 1-error:0.06597
[22]
        validation 0-logloss:0.28952
                                         validation 0-error:0.04839
validation 1-logloss:0.29954
                                 validation 1-error:0.06147
        validation 0-logloss:0.28192
                                         validation 0-error:0.04539
validation_1-logloss:0.29195
                                 validation 1-error:0.05847
[24]
        validation_0-logloss:0.27477
                                         validation 0-error:0.04539
validation_1-logloss:0.28516
                                 validation_1-error:0.05847
        validation_0-logloss:0.26789
                                         validation_0-error:0.04501
[25]
validation_1-logloss:0.27868
                                 validation_1-error:0.05697
        validation_0-logloss:0.26153
[26]
                                         validation_0-error:0.04389
validation_1-logloss:0.27269
                                 validation 1-error:0.05697
        validation_0-logloss:0.25541
[27]
                                         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
        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
validation_1-logloss:0.24230
                                 validation_1-error:0.05697
        validation_0-logloss:0.22560
                                         validation_0-error:0.04276
[33]
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
        validation 0-logloss:0.21046
                                         validation 0-error:0.03939
validation 1-logloss:0.22358
                                 validation 1-error:0.05397
        validation 0-logloss:0.20733
                                         validation 0-error:0.03901
[38]
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
        validation_0-logloss:0.20110
                                         validation_0-error:0.03976
[40]
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
        validation_0-logloss:0.19575
[42]
                                         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
        validation_0-logloss:0.18830
                                         validation_0-error:0.03788
[45]
validation_1-logloss:0.20283
                                 validation 1-error:0.05247
        validation 0-logloss:0.18552
                                         validation 0-error:0.03826
[46]
validation 1-logloss:0.19944
                                 validation 1-error:0.04947
        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
        validation_0-logloss:0.17932
                                         validation_0-error:0.03676
[49]
validation_1-logloss:0.19365
                                 validation_1-error:0.05097
        validation_0-logloss:0.17705
[50]
                                         validation_0-error:0.03601
validation_1-logloss:0.19081
                                 validation_1-error:0.04947
        validation_0-logloss:0.17547
[51]
                                         validation_0-error:0.03601
validation_1-logloss:0.18963
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17353
                                         validation_0-error:0.03601
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
[53]
        validation_0-logloss:0.17172
                                         validation_0-error:0.03638
validation 1-logloss:0.18606
                                 validation 1-error:0.05097
        validation_0-logloss:0.17038
                                         validation 0-error:0.03638
validation 1-logloss:0.18542
                                 validation 1-error:0.05097
        validation_0-logloss:0.16875
                                         validation_0-error:0.03638
validation_1-logloss:0.18403
                                 validation_1-error:0.05097
[56]
        validation_0-logloss:0.16720
                                         validation_0-error:0.03676
validation_1-logloss:0.18254
                                 validation_1-error:0.05097
        validation_0-logloss:0.16582
                                         validation_0-error:0.03676
[57]
validation_1-logloss:0.18126
                                 validation_1-error:0.05097
[58]
        validation_0-logloss:0.16482
                                         validation_0-error:0.03676
validation_1-logloss:0.18080
                                 validation_1-error:0.04947
[59]
        validation_0-logloss:0.16354
                                         validation_0-error:0.03676
validation_1-logloss:0.17999
                                 validation_1-error:0.04947
[60]
        validation_0-logloss:0.16225
                                         validation_0-error:0.03676
validation_1-logloss:0.17897
                                 validation 1-error:0.04947
        validation 0-logloss:0.16134
                                         validation 0-error:0.03713
validation 1-logloss:0.17849
                                 validation 1-error:0.04947
        validation 0-logloss:0.16050
                                         validation 0-error:0.03713
[62]
validation_1-logloss:0.17793
                                 validation 1-error:0.04947
        validation_0-logloss:0.15937
                                         validation_0-error:0.03676
[63]
validation_1-logloss:0.17710
                                 validation 1-error:0.04947
        validation_0-logloss:0.15855
                                         validation_0-error:0.03638
[64]
validation_1-logloss:0.17649
                                 validation_1-error:0.04947
[65]
        validation_0-logloss:0.15790
                                         validation_0-error:0.03601
validation_1-logloss:0.17627
                                 validation 1-error:0.04947
        validation_0-logloss:0.15723
[66]
                                         validation_0-error:0.03601
validation_1-logloss:0.17582
                                 validation_1-error:0.04947
[67]
        validation_0-logloss:0.15668
                                         validation_0-error:0.03601
validation_1-logloss:0.17589
                                 validation_1-error:0.04947
```

```
[68]
        validation_0-logloss:0.15559
                                         validation_0-error:0.03563
validation_1-logloss:0.17503
                                 validation_1-error:0.04947
        validation_0-logloss:0.15493
                                         validation_0-error:0.03563
[69]
validation_1-logloss:0.17435
                                 validation 1-error:0.04947
        validation 0-logloss:0.15425
                                         validation 0-error:0.03563
[70]
validation 1-logloss:0.17393
                                 validation 1-error:0.04798
        validation 0-logloss:0.15370
                                         validation 0-error:0.03563
validation_1-logloss:0.17341
                                 validation 1-error:0.04798
[72]
        validation_0-logloss:0.15274
                                         validation 0-error:0.03563
                                 validation_1-error:0.04798
validation_1-logloss:0.17284
        validation_0-logloss:0.15214
                                         validation_0-error:0.03563
[73]
validation_1-logloss:0.17253
                                 validation_1-error:0.04798
        validation_0-logloss:0.15161
                                         validation_0-error:0.03563
[74]
validation_1-logloss:0.17220
                                 validation 1-error:0.04798
        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
                                         validation_0-error:0.07014
[2]
        validation_0-logloss:0.59327
validation 1-logloss:0.59593
                                 validation 1-error:0.08846
        validation_0-logloss:0.56571
                                         validation 0-error:0.05851
validation 1-logloss:0.56896
                                 validation 1-error:0.06897
        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
        validation_0-logloss:0.49546
                                         validation_0-error:0.05851
validation_1-logloss:0.50043
                                 validation_1-error:0.06897
        validation_0-logloss:0.47571
                                         validation_0-error:0.05851
[7]
validation_1-logloss:0.48110
                                 validation_1-error:0.06897
        validation_0-logloss:0.45725
                                         validation_0-error:0.05851
[8]
                                 validation_1-error:0.06897
validation_1-logloss:0.46312
        validation_0-logloss:0.44024
[9]
                                         validation_0-error:0.05851
validation_1-logloss:0.44673
                                 validation 1-error:0.06897
        validation 0-logloss:0.42433
                                         validation 0-error:0.05851
validation 1-logloss:0.43172
                                 validation 1-error:0.06897
        validation 0-logloss:0.40961
                                         validation 0-error:0.05851
validation_1-logloss:0.41709
                                 validation 1-error:0.06897
        validation_0-logloss:0.39581
                                         validation_0-error:0.05664
[12]
validation_1-logloss:0.40411
                                 validation 1-error:0.07046
        validation_0-logloss:0.38299
                                         validation_0-error:0.05664
[13]
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
        validation_0-logloss:0.35988
[15]
                                         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
validation_1-logloss:0.34653
                                 validation_1-error:0.07046
        validation_0-logloss:0.32702
                                         validation_0-error:0.05476
[18]
validation_1-logloss:0.33613
                                 validation 1-error:0.06747
        validation 0-logloss:0.31710
                                         validation 0-error:0.05514
Г197
validation 1-logloss:0.32652
                                 validation 1-error:0.06747
        validation 0-logloss:0.30785
                                         validation 0-error:0.05439
validation_1-logloss:0.31774
                                 validation 1-error:0.06747
        validation_0-logloss:0.29898
                                         validation 0-error:0.05364
[21]
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
        validation_0-logloss:0.28295
                                         validation_0-error:0.05514
[23]
validation_1-logloss:0.29356
                                 validation 1-error:0.06747
        validation_0-logloss:0.27570
[24]
                                         validation_0-error:0.05064
validation_1-logloss:0.28654
                                 validation_1-error:0.06297
[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
        validation_0-logloss:0.25629
                                         validation 0-error:0.04651
validation 1-logloss:0.26737
                                 validation 1-error:0.05847
[28]
        validation_0-logloss:0.25057
                                         validation_0-error:0.04389
validation_1-logloss:0.26215
                                 validation 1-error:0.05547
[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
        validation_0-logloss:0.23537
                                         validation_0-error:0.04163
[31]
validation_1-logloss:0.24732
                                 validation_1-error:0.05397
[32]
        validation_0-logloss:0.23098
                                         validation_0-error:0.04088
                                 validation_1-error:0.05247
validation_1-logloss:0.24277
[33]
        validation_0-logloss:0.22665
                                         validation_0-error:0.04013
validation_1-logloss:0.23872
                                 validation 1-error:0.04947
        validation 0-logloss:0.22243
                                         validation 0-error:0.04013
validation 1-logloss:0.23467
                                 validation 1-error:0.04947
        validation 0-logloss:0.21867
                                         validation 0-error:0.04013
[35]
validation_1-logloss:0.23132
                                 validation 1-error:0.04947
        validation_0-logloss:0.21443
                                         validation_0-error:0.03901
[36]
validation_1-logloss:0.22645
                                 validation 1-error:0.04798
        validation_0-logloss:0.21108
                                         validation_0-error:0.03788
[37]
validation_1-logloss:0.22352
                                 validation_1-error:0.04798
[38]
        validation_0-logloss:0.20779
                                         validation_0-error:0.03788
validation_1-logloss:0.21986
                                 validation 1-error:0.04648
        validation_0-logloss:0.20456
[39]
                                         validation_0-error:0.03826
validation_1-logloss:0.21682
                                 validation_1-error:0.04798
[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
        validation_0-logloss:0.19570
[42]
                                         validation_0-error:0.03676
validation_1-logloss:0.20822
                                 validation 1-error:0.04348
        validation 0-logloss:0.19295
                                         validation 0-error:0.03638
Γ431
validation 1-logloss:0.20544
                                 validation 1-error:0.04648
        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
validation_1-logloss:0.20031
                                 validation_1-error:0.04348
        validation_0-logloss:0.18526
                                         validation_0-error:0.03526
[46]
validation_1-logloss:0.19755
                                 validation_1-error:0.04348
        validation_0-logloss:0.18284
[47]
                                         validation_0-error:0.03526
validation_1-logloss:0.19452
                                 validation 1-error:0.04348
        validation_0-logloss:0.18089
[48]
                                         validation_0-error:0.03488
validation_1-logloss:0.19283
                                 validation_1-error:0.04498
[49]
        validation_0-logloss:0.17875
                                         validation_0-error:0.03488
validation_1-logloss:0.19091
                                 validation_1-error:0.04498
[50]
        validation_0-logloss:0.17659
                                         validation_0-error:0.03488
                                 validation_1-error:0.04348
validation 1-logloss:0.18861
        validation 0-logloss:0.17471
                                         validation 0-error:0.03526
validation 1-logloss:0.18696
                                 validation 1-error:0.04348
[52]
        validation_0-logloss:0.17282
                                         validation_0-error:0.03488
validation_1-logloss:0.18448
                                 validation 1-error:0.04348
[53]
        validation_0-logloss:0.17106
                                         validation_0-error:0.03488
validation_1-logloss:0.18295
                                 validation_1-error:0.04048
        validation_0-logloss:0.16928
                                         validation_0-error:0.03526
[54]
validation_1-logloss:0.18091
                                 validation_1-error:0.03898
[55]
        validation_0-logloss:0.16761
                                         validation 0-error:0.03488
validation_1-logloss:0.17945
                                 validation_1-error:0.04048
[56]
        validation_0-logloss:0.16630
                                         validation_0-error:0.03488
validation_1-logloss:0.17847
                                 validation_1-error:0.04198
[57]
        validation_0-logloss:0.16503
                                         validation_0-error:0.03413
validation 1-logloss:0.17715
                                 validation 1-error:0.04048
        validation 0-logloss:0.16382
                                         validation 0-error:0.03413
validation 1-logloss:0.17645
                                 validation 1-error:0.04048
        validation 0-logloss:0.16232
                                         validation 0-error:0.03376
[59]
validation_1-logloss:0.17444
                                 validation 1-error:0.03898
        validation_0-logloss:0.16120
                                         validation_0-error:0.03413
[60]
validation_1-logloss:0.17365
                                 validation 1-error:0.03748
        validation_0-logloss:0.15983
                                         validation_0-error:0.03338
[61]
validation_1-logloss:0.17180
                                 validation_1-error:0.03748
[62]
        validation_0-logloss:0.15873
                                         validation_0-error:0.03338
validation_1-logloss:0.17120
                                 validation 1-error:0.03748
        validation_0-logloss:0.15754
[63]
                                         validation_0-error:0.03338
validation_1-logloss:0.16954
                                 validation_1-error:0.03598
[64]
        validation_0-logloss:0.15660
                                         validation_0-error:0.03301
validation_1-logloss:0.16865
                                 validation_1-error:0.03748
```

```
[65]
        validation_0-logloss:0.15551
                                         validation_0-error:0.03338
validation_1-logloss:0.16726
                                 validation_1-error:0.03598
        validation_0-logloss:0.15449
                                         validation_0-error:0.03338
[66]
validation_1-logloss:0.16655
                                 validation 1-error:0.03598
        validation 0-logloss:0.15354
                                         validation 0-error:0.03301
[67]
validation 1-logloss:0.16563
                                 validation 1-error:0.03598
        validation 0-logloss:0.15267
                                         validation 0-error:0.03263
validation_1-logloss:0.16470
                                 validation 1-error:0.03598
[69]
        validation_0-logloss:0.15201
                                         validation 0-error:0.03226
validation_1-logloss:0.16424
                                 validation_1-error:0.03598
        validation_0-logloss:0.15091
                                         validation_0-error:0.03113
[70]
validation_1-logloss:0.16286
                                 validation_1-error:0.03298
        validation_0-logloss:0.14993
[71]
                                         validation_0-error:0.03113
validation_1-logloss:0.16206
                                 validation 1-error:0.03148
        validation_0-logloss:0.14948
[72]
                                         validation_0-error:0.03113
validation_1-logloss:0.16152
                                 validation_1-error:0.03298
[73]
        validation_0-logloss:0.14888
                                         validation_0-error:0.03113
validation_1-logloss:0.16121
                                 validation_1-error:0.03148
[74]
        validation_0-logloss:0.14841
                                         validation_0-error:0.03113
validation 1-logloss:0.16084
                                 validation 1-error:0.03148
        validation 0-logloss:0.14767
                                         validation 0-error:0.03113
validation 1-logloss:0.16027
                                 validation 1-error:0.03148
[76]
        validation_0-logloss:0.14669
                                         validation_0-error:0.03113
validation 1-logloss:0.15951
                                 validation_1-error:0.03298
[77]
        validation_0-logloss:0.14611
                                         validation_0-error:0.03038
validation_1-logloss:0.15937
                                 validation_1-error:0.03298
        validation_0-logloss:0.14530
                                         validation_0-error:0.03038
[78]
validation_1-logloss:0.15875
                                 validation_1-error:0.03298
[79]
        validation_0-logloss:0.14441
                                         validation 0-error:0.03038
validation_1-logloss:0.15832
                                 validation_1-error:0.03298
[80]
        validation_0-logloss:0.14402
                                         validation_0-error:0.03001
                                 validation_1-error:0.03298
validation_1-logloss:0.15814
[81]
        validation_0-logloss:0.14335
                                         validation_0-error:0.03001
validation 1-logloss:0.15750
                                 validation 1-error:0.03298
        validation 0-logloss:0.14284
                                         validation 0-error:0.03001
validation 1-logloss:0.15750
                                 validation 1-error:0.03298
        validation 0-logloss:0.14203
                                         validation 0-error:0.02963
[83]
validation_1-logloss:0.15722
                                 validation 1-error:0.03298
        validation_0-logloss:0.14146
                                         validation_0-error:0.02963
[84]
validation_1-logloss:0.15674
                                 validation 1-error:0.03298
        validation_0-logloss:0.14116
                                         validation_0-error:0.02963
[85]
validation_1-logloss:0.15635
                                 validation_1-error:0.03298
[86]
        validation_0-logloss:0.14048
                                         validation_0-error:0.03038
validation_1-logloss:0.15589
                                 validation 1-error:0.03298
        validation_0-logloss:0.13969
[87]
                                         validation_0-error:0.03038
validation_1-logloss:0.15572
                                 validation_1-error:0.03298
[88]
        validation_0-logloss:0.13948
                                         validation_0-error:0.03038
validation_1-logloss:0.15563
                                 validation_1-error:0.03298
```

```
validation_1-logloss:0.15514
                                validation_1-error:0.03298
        validation_0-logloss:0.65635
                                         validation_0-error:0.07164
[0]
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
        validation 0-logloss:0.59274
                                         validation 0-error:0.06602
validation 1-logloss:0.59444
                                validation 1-error:0.07946
        validation 0-logloss:0.56488
                                         validation 0-error:0.06564
[3]
validation_1-logloss:0.56722
                                validation_1-error:0.07946
        validation_0-logloss:0.53949
                                         validation_0-error:0.05326
validation_1-logloss:0.54207
                                validation_1-error:0.06597
        validation_0-logloss:0.51600
                                         validation_0-error:0.06452
[5]
validation_1-logloss:0.51943
                                validation_1-error:0.07496
        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
        validation_0-logloss:0.45587
                                         validation_0-error:0.05251
validation_1-logloss:0.46044
                                validation_1-error:0.05397
        validation_0-logloss:0.43873
                                         validation_0-error:0.05251
[9]
validation 1-logloss:0.44395
                                validation 1-error:0.05397
        validation 0-logloss:0.42282
[10]
                                         validation 0-error:0.05251
validation 1-logloss:0.42863
                                validation 1-error:0.05397
        validation_0-logloss:0.40796
                                         validation 0-error:0.05251
[11]
validation_1-logloss:0.41410
                                validation_1-error:0.05397
Γ12]
        validation_0-logloss:0.39412
                                         validation_0-error:0.05251
validation_1-logloss:0.40060
                                validation_1-error:0.05397
        validation_0-logloss:0.38123
                                         validation_0-error:0.05251
[13]
validation_1-logloss:0.38834
                                validation_1-error:0.05397
        validation_0-logloss:0.36919
                                         validation_0-error:0.05251
[14]
validation_1-logloss:0.37644
                                validation_1-error:0.05397
        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_0-error:0.03038

[89]

validation_0-logloss:0.13897

```
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
        validation_0-logloss:0.32619
                                         validation_0-error:0.05364
[18]
validation 1-logloss:0.33253
                                 validation 1-error:0.05697
        validation 0-logloss:0.31621
                                         validation 0-error:0.05364
[19]
validation 1-logloss:0.32277
                                 validation_1-error:0.05547
[20]
        validation_0-logloss:0.30685
                                         validation 0-error:0.05401
validation 1-logloss:0.31383
                                 validation 1-error:0.05847
                                         validation_0-error:0.05401
[21]
        validation_0-logloss:0.29816
validation_1-logloss:0.30530
                                 validation_1-error:0.05847
[22]
        validation_0-logloss:0.28995
                                         validation_0-error:0.05326
validation_1-logloss:0.29697
                                 validation_1-error:0.05697
        validation_0-logloss:0.28238
                                         validation_0-error:0.05289
[23]
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
        validation 0-logloss:0.25627
[27]
                                         validation 0-error:0.05139
validation_1-logloss:0.26466
                                 validation_1-error:0.04947
        validation 0-logloss:0.25044
                                         validation_0-error:0.05139
[28]
validation_1-logloss:0.25882
                                 validation_1-error:0.04947
        validation_0-logloss:0.24524
                                         validation_0-error:0.04989
[29]
validation_1-logloss:0.25348
                                 validation_1-error:0.04947
        validation_0-logloss:0.24031
[30]
                                         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
        validation_0-logloss:0.23107
[32]
                                         validation_0-error:0.04389
validation_1-logloss:0.24003
                                 validation_1-error:0.04798
        validation_0-logloss:0.22665
                                         validation_0-error:0.04389
[33]
validation 1-logloss:0.23598
                                 validation 1-error:0.04798
        validation 0-logloss:0.22258
[34]
                                         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
        validation_0-logloss:0.21097
                                         validation_0-error:0.04239
[37]
validation_1-logloss:0.22071
                                 validation_1-error:0.04798
        validation_0-logloss:0.20745
                                         validation_0-error:0.04088
[38]
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
[40]
        validation_0-logloss:0.20135
                                         validation_0-error:0.04088
```

```
validation_1-logloss:0.21103
                                 validation_1-error:0.04648
[41]
        validation_0-logloss:0.19809
                                         validation_0-error:0.04088
validation_1-logloss:0.20724
                                 validation_1-error:0.04648
[42]
        validation_0-logloss:0.19538
                                         validation 0-error:0.04088
validation 1-logloss:0.20480
                                 validation 1-error:0.04648
[43]
        validation 0-logloss:0.19282
                                         validation 0-error:0.04051
validation 1-logloss:0.20266
                                 validation 1-error:0.04498
Γ441
        validation_0-logloss:0.19022
                                         validation 0-error:0.03939
validation 1-logloss:0.19973
                                 validation 1-error:0.04348
                                         validation_0-error:0.03939
[45]
        validation_0-logloss:0.18790
validation_1-logloss:0.19771
                                 validation_1-error:0.04348
[46]
        validation_0-logloss:0.18535
                                         validation_0-error:0.03901
validation_1-logloss:0.19451
                                 validation_1-error:0.04348
        validation_0-logloss:0.18329
                                         validation_0-error:0.03901
[47]
validation_1-logloss:0.19288
                                 validation_1-error:0.04348
[48]
        validation_0-logloss:0.18098
                                         validation_0-error:0.03901
validation_1-logloss:0.19016
                                 validation_1-error:0.04348
[49]
        validation_0-logloss:0.17901
                                         validation_0-error:0.03939
validation_1-logloss:0.18861
                                 validation 1-error:0.04348
[50]
        validation 0-logloss:0.17709
                                         validation 0-error:0.03864
validation 1-logloss:0.18636
                                 validation 1-error:0.04348
        validation 0-logloss:0.17550
                                         validation 0-error:0.03901
[51]
validation_1-logloss:0.18495
                                 validation 1-error:0.04348
        validation_0-logloss:0.17390
                                         validation_0-error:0.03864
[52]
validation_1-logloss:0.18339
                                 validation_1-error:0.04348
        validation_0-logloss:0.17223
                                         validation_0-error:0.03826
[53]
validation_1-logloss:0.18158
                                 validation_1-error:0.04348
        validation_0-logloss:0.17064
[54]
                                         validation_0-error:0.03826
validation_1-logloss:0.17995
                                 validation 1-error:0.04348
[55]
        validation_0-logloss:0.16922
                                         validation_0-error:0.03788
validation_1-logloss:0.17907
                                 validation_1-error:0.04348
[56]
        validation_0-logloss:0.16780
                                         validation_0-error:0.03826
validation_1-logloss:0.17750
                                 validation_1-error:0.04348
[57]
        validation_0-logloss:0.16632
                                         validation_0-error:0.03713
validation 1-logloss:0.17639
                                 validation 1-error:0.04198
        validation 0-logloss:0.16505
[58]
                                         validation 0-error:0.03713
validation 1-logloss:0.17517
                                 validation_1-error:0.04198
[59]
        validation_0-logloss:0.16364
                                         validation 0-error:0.03713
validation_1-logloss:0.17399
                                 validation_1-error:0.04198
        validation_0-logloss:0.16243
                                         validation 0-error:0.03638
[60]
validation_1-logloss:0.17303
                                 validation_1-error:0.04198
        validation_0-logloss:0.16115
                                         validation_0-error:0.03563
[61]
validation_1-logloss:0.17214
                                 validation_1-error:0.04198
[62]
        validation_0-logloss:0.16005
                                         validation_0-error:0.03638
validation_1-logloss:0.17123
                                 validation_1-error:0.04198
[63]
        validation_0-logloss:0.15883
                                         validation_0-error:0.03638
validation_1-logloss:0.17086
                                 validation_1-error:0.04198
[64]
        validation_0-logloss:0.15804
                                         validation_0-error:0.03638
```

```
validation_1-logloss:0.17028
                                 validation_1-error:0.04198
[65]
        validation_0-logloss:0.15706
                                         validation_0-error:0.03638
validation_1-logloss:0.16933
                                 validation_1-error:0.04198
        validation_0-logloss:0.15604
                                         validation_0-error:0.03638
[66]
validation 1-logloss:0.16906
                                 validation 1-error:0.04198
[67]
        validation 0-logloss:0.15509
                                         validation 0-error:0.03638
validation 1-logloss:0.16829
                                 validation 1-error:0.04198
[68]
        validation_0-logloss:0.15443
                                         validation_0-error:0.03638
validation 1-logloss:0.16780
                                 validation 1-error:0.04198
                                         validation_0-error:0.03601
[69]
        validation_0-logloss:0.15353
validation_1-logloss:0.16695
                                 validation_1-error:0.04198
[70]
        validation_0-logloss:0.15293
                                         validation_0-error:0.03601
validation_1-logloss:0.16646
                                 validation_1-error:0.04048
        validation_0-logloss:0.15213
                                         validation_0-error:0.03601
[71]
validation_1-logloss:0.16605
                                 validation_1-error:0.04048
[72]
        validation_0-logloss:0.15145
                                         validation_0-error:0.03601
validation_1-logloss:0.16570
                                 validation_1-error:0.04048
[73]
        validation_0-logloss:0.15087
                                         validation_0-error:0.03563
validation_1-logloss:0.16501
                                 validation 1-error:0.04048
Γ741
        validation 0-logloss:0.15017
                                         validation 0-error:0.03563
validation 1-logloss:0.16470
                                 validation 1-error:0.04048
        validation 0-logloss:0.14965
                                         validation 0-error:0.03563
[75]
validation_1-logloss:0.16434
                                 validation 1-error:0.04048
        validation_0-logloss:0.14889
                                         validation_0-error:0.03563
[76]
validation_1-logloss:0.16399
                                 validation_1-error:0.04048
        validation_0-logloss:0.14787
                                         validation_0-error:0.03488
[77]
validation_1-logloss:0.16329
                                 validation_1-error:0.04048
        validation_0-logloss:0.14713
[78]
                                         validation_0-error:0.03488
validation_1-logloss:0.16309
                                 validation 1-error:0.04048
[79]
        validation_0-logloss:0.14663
                                         validation_0-error:0.03451
validation_1-logloss:0.16275
                                 validation_1-error:0.04048
[80]
        validation_0-logloss:0.14567
                                         validation_0-error:0.03451
validation_1-logloss:0.16214
                                 validation_1-error:0.04048
[81]
        validation_0-logloss:0.14491
                                         validation_0-error:0.03451
validation 1-logloss:0.16196
                                 validation 1-error:0.04048
        validation 0-logloss:0.14448
[82]
                                         validation 0-error:0.03451
validation 1-logloss:0.16162
                                 validation_1-error:0.04048
[83]
        validation_0-logloss:0.14354
                                         validation 0-error:0.03376
validation_1-logloss:0.16127
                                 validation_1-error:0.04048
        validation_0-logloss:0.14288
                                         validation 0-error:0.03338
[84]
validation_1-logloss:0.16088
                                 validation_1-error:0.04048
        validation_0-logloss:0.14225
                                         validation_0-error:0.03338
[85]
validation_1-logloss:0.16119
                                 validation_1-error:0.04048
        validation_0-logloss:0.14138
                                         validation_0-error:0.03338
[86]
validation_1-logloss:0.16077
                                 validation_1-error:0.04048
[87]
        validation_0-logloss:0.14076
                                         validation_0-error:0.03338
validation_1-logloss:0.16064
                                 validation_1-error:0.04048
[88]
        validation_0-logloss:0.14011
                                         validation_0-error:0.03338
```

```
validation_1-logloss:0.16064
                                 validation_1-error:0.04048
[89]
        validation_0-logloss:0.13976
                                         validation_0-error:0.03338
validation_1-logloss:0.16045
                                 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
        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
                                         validation_0-error:0.06827
        validation_0-logloss:0.56486
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
        validation_0-logloss:0.51600
                                         validation_0-error:0.06639
validation_1-logloss:0.51928
                                 validation_1-error:0.08246
        validation_0-logloss:0.49442
                                         validation_0-error:0.06639
validation_1-logloss:0.49800
                                 validation_1-error:0.08246
        validation_0-logloss:0.47446
                                         validation_0-error:0.05514
[7]
validation_1-logloss:0.47815
                                 validation 1-error:0.06297
        validation 0-logloss:0.45552
                                         validation 0-error:0.05439
validation 1-logloss:0.45915
                                 validation 1-error:0.05847
        validation 0-logloss:0.43787
[9]
                                         validation 0-error:0.05439
validation_1-logloss:0.44190
                                 validation_1-error:0.05997
        validation_0-logloss:0.42171
                                         validation_0-error:0.05476
[10]
validation_1-logloss:0.42654
                                 validation_1-error:0.05997
        validation_0-logloss:0.40621
                                         validation_0-error:0.05401
[11]
validation_1-logloss:0.41120
                                 validation_1-error:0.06597
        validation_0-logloss:0.39171
[12]
                                         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
        validation_0-logloss:0.36519
                                         validation_0-error:0.04726
validation_1-logloss:0.37152
                                 validation_1-error:0.05997
        validation_0-logloss:0.35354
                                         validation_0-error:0.04801
[15]
validation 1-logloss:0.36017
                                 validation 1-error:0.05697
        validation 0-logloss:0.34257
[16]
                                         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
        validation_0-logloss:0.32201
Г18<sub>]</sub>
                                         validation_0-error:0.04801
validation_1-logloss:0.32957
                                 validation_1-error:0.05397
        validation_0-logloss:0.31274
                                         validation_0-error:0.04614
[19]
validation_1-logloss:0.32093
                                 validation_1-error:0.05397
        validation_0-logloss:0.30398
                                         validation_0-error:0.04464
[20]
validation_1-logloss:0.31267
                                 validation_1-error:0.05097
[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
```

```
validation_1-logloss:0.29649
                                 validation_1-error:0.05097
[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
        validation 0-logloss:0.26602
                                         validation 0-error:0.04389
[25]
validation 1-logloss:0.27631
                                 validation_1-error:0.05247
[26]
        validation_0-logloss:0.25993
                                         validation 0-error:0.04389
validation 1-logloss:0.27061
                                 validation 1-error:0.05397
                                         validation_0-error:0.04276
[27]
        validation_0-logloss:0.25396
validation_1-logloss:0.26505
                                 validation_1-error:0.05397
[28]
        validation_0-logloss:0.24857
                                         validation_0-error:0.04201
validation_1-logloss:0.25969
                                 validation_1-error:0.05397
        validation_0-logloss:0.24283
                                         validation_0-error:0.04163
[29]
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
        validation_0-logloss:0.23274
                                         validation_0-error:0.04088
[31]
validation_1-logloss:0.24411
                                 validation 1-error:0.05397
Γ321
        validation 0-logloss:0.22811
                                         validation 0-error:0.04126
validation 1-logloss:0.24011
                                 validation 1-error:0.05397
        validation 0-logloss:0.22375
[33]
                                         validation 0-error:0.04013
validation_1-logloss:0.23633
                                 validation_1-error:0.05397
        validation_0-logloss:0.21969
                                         validation 0-error:0.04051
[34]
validation_1-logloss:0.23258
                                 validation_1-error:0.05397
        validation_0-logloss:0.21593
                                         validation_0-error:0.04013
[35]
validation_1-logloss:0.22920
                                 validation_1-error:0.05397
        validation_0-logloss:0.21217
[36]
                                         validation_0-error:0.04051
validation_1-logloss:0.22553
                                 validation 1-error:0.05697
[37]
        validation_0-logloss:0.20874
                                         validation_0-error:0.03864
validation_1-logloss:0.22231
                                 validation_1-error:0.05397
        validation_0-logloss:0.20537
[38]
                                         validation_0-error:0.03864
validation_1-logloss:0.21918
                                 validation_1-error:0.05397
[39]
        validation_0-logloss:0.20178
                                         validation_0-error:0.03901
validation 1-logloss:0.21513
                                 validation 1-error:0.05397
        validation 0-logloss:0.19883
[40]
                                         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
validation_1-logloss:0.20636
                                 validation_1-error:0.05247
        validation_0-logloss:0.19069
                                         validation_0-error:0.03638
[43]
validation_1-logloss:0.20449
                                 validation_1-error:0.05097
        validation_0-logloss:0.18811
                                         validation_0-error:0.03601
[44]
validation_1-logloss:0.20250
                                 validation_1-error:0.05247
[45]
        validation_0-logloss:0.18547
                                         validation_0-error:0.03601
validation_1-logloss:0.19980
                                 validation_1-error:0.05547
[46]
        validation_0-logloss:0.18335
                                         validation_0-error:0.03488
```

```
validation_1-logloss:0.19775
                                 validation_1-error:0.05397
[47]
        validation_0-logloss:0.18118
                                         validation_0-error:0.03488
validation_1-logloss:0.19579
                                 validation_1-error:0.05247
[48]
        validation_0-logloss:0.17898
                                         validation_0-error:0.03526
validation 1-logloss:0.19333
                                 validation 1-error:0.04947
        validation 0-logloss:0.17688
                                         validation 0-error:0.03526
[49]
validation 1-logloss:0.19160
                                 validation 1-error:0.05097
[50]
        validation_0-logloss:0.17487
                                         validation 0-error:0.03526
validation 1-logloss:0.18951
                                 validation 1-error:0.05097
                                         validation_0-error:0.03563
[51]
        validation_0-logloss:0.17306
validation_1-logloss:0.18800
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17104
                                         validation_0-error:0.03451
validation_1-logloss:0.18554
                                 validation_1-error:0.04798
        validation_0-logloss:0.16942
                                         validation_0-error:0.03413
[53]
validation_1-logloss:0.18404
                                 validation_1-error:0.04798
[54]
        validation_0-logloss:0.16779
                                         validation_0-error:0.03413
validation_1-logloss:0.18239
                                 validation_1-error:0.04798
[55]
        validation_0-logloss:0.16645
                                         validation_0-error:0.03376
validation_1-logloss:0.18186
                                 validation 1-error:0.04947
Γ561
        validation 0-logloss:0.16491
                                         validation 0-error:0.03376
validation 1-logloss:0.18057
                                 validation 1-error:0.04498
        validation 0-logloss:0.16321
                                         validation 0-error:0.03376
[57]
validation_1-logloss:0.17852
                                 validation 1-error:0.04498
        validation 0-logloss:0.16180
                                         validation 0-error:0.03376
[58]
validation_1-logloss:0.17744
                                 validation_1-error:0.04648
        validation_0-logloss:0.16032
                                         validation_0-error:0.03376
[59]
validation_1-logloss:0.17574
                                 validation_1-error:0.04648
        validation_0-logloss:0.15895
[60]
                                         validation_0-error:0.03376
validation_1-logloss:0.17399
                                 validation 1-error:0.04498
[61]
        validation_0-logloss:0.15772
                                         validation_0-error:0.03376
validation_1-logloss:0.17342
                                 validation_1-error:0.04498
[62]
        validation_0-logloss:0.15643
                                         validation_0-error:0.03226
validation_1-logloss:0.17188
                                 validation_1-error:0.04498
        validation_0-logloss:0.15523
                                         validation_0-error:0.03188
[63]
validation 1-logloss:0.17035
                                 validation 1-error:0.04498
        validation 0-logloss:0.15419
[64]
                                         validation 0-error:0.03226
validation 1-logloss:0.16979
                                 validation_1-error:0.04648
[65]
        validation_0-logloss:0.15305
                                         validation 0-error:0.03226
validation_1-logloss:0.16841
                                 validation_1-error:0.04348
        validation_0-logloss:0.15226
[66]
                                         validation 0-error:0.03226
validation_1-logloss:0.16788
                                 validation_1-error:0.04348
        validation_0-logloss:0.15124
                                         validation_0-error:0.03226
[67]
validation_1-logloss:0.16656
                                 validation_1-error:0.04198
        validation_0-logloss:0.15033
                                         validation_0-error:0.03226
[68]
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_0-logloss:0.14763
                                         validation_0-error:0.03151
[71]
validation_1-logloss:0.16371
                                validation_1-error:0.04348
[72]
        validation_0-logloss:0.14685
                                         validation_0-error:0.03113
validation 1-logloss:0.16268
                                validation 1-error:0.04198
        validation 0-logloss:0.14626
                                         validation 0-error:0.03151
[73]
validation 1-logloss:0.16236
                                validation_1-error:0.04198
[74]
        validation_0-logloss:0.14552
                                         validation_0-error:0.03151
validation 1-logloss:0.16145
                                validation 1-error:0.04198
[75]
        validation_0-logloss:0.14470
                                         validation_0-error:0.03113
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
        validation_0-logloss:0.14319
                                        validation_0-error:0.03076
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
[80]
        validation 0-logloss:0.14123
                                         validation 0-error:0.03001
                                validation 1-error:0.04198
validation 1-logloss:0.15881
        validation 0-logloss:0.14061
                                         validation 0-error:0.03001
[81]
validation_1-logloss:0.15813
                                validation_1-error:0.04198
        validation 0-logloss:0.14005
                                         validation_0-error:0.03001
[82]
validation_1-logloss:0.15798
                                validation_1-error:0.04198
        validation_0-logloss:0.13940
                                         validation_0-error:0.03001
[83]
validation_1-logloss:0.15746
                                validation_1-error:0.04048
        validation_0-logloss:0.13887
[84]
                                        validation_0-error:0.03001
validation_1-logloss:0.15674
                                validation 1-error:0.04048
[85]
        validation_0-logloss:0.13836
                                         validation_0-error:0.02963
validation_1-logloss:0.15660
                                validation_1-error:0.04048
        validation_0-logloss:0.13768
                                         validation_0-error:0.02963
validation_1-logloss:0.15623
                                validation_1-error:0.04048
[87]
        validation_0-logloss:0.13726
                                         validation_0-error:0.02963
validation 1-logloss:0.15615
                                validation 1-error:0.04048
        validation 0-logloss:0.13674
[88]
                                         validation 0-error:0.02963
validation 1-logloss:0.15606
                                validation 1-error:0.04048
        validation_0-logloss:0.13623
                                         validation 0-error:0.02963
validation_1-logloss:0.15543
                                validation_1-error:0.04048
        validation 0-logloss:0.65600
[0]
                                         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)
```

validation_1-error:0.04198

validation_1-logloss:0.16465

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)

validation 0-logloss:0.62239 validation 0-error:0.07127 [1] 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 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 validation_0-logloss:0.51505 validation_0-error:0.07127 [5] validation_1-logloss:0.52056 validation_1-error:0.08846 [6] validation_0-logloss:0.49352 validation_0-error:0.07127 validation 1-logloss:0.50012 validation 1-error:0.08846 validation_0-logloss:0.47330 validation_0-error:0.07089 validation 1-logloss:0.48052 validation 1-error:0.08846 validation_0-logloss:0.45494 validation_0-error:0.07089 validation 1-logloss:0.46318 validation 1-error:0.08846 validation_0-logloss:0.43762 validation_0-error:0.07089 [9] validation 1-logloss:0.44640 validation 1-error:0.08846 validation_0-logloss:0.42183 validation_0-error:0.07089 validation_1-logloss:0.43162 validation_1-error:0.08846 [11] validation_0-logloss:0.40661 validation_0-error:0.07089 validation_1-logloss:0.41690 validation_1-error:0.09145 validation_0-logloss:0.39279 validation_0-error:0.07089 [12] validation_1-logloss:0.40372 validation_1-error:0.09145 validation_0-logloss:0.37958 validation_0-error:0.07052 [13] validation_1-logloss:0.39076 validation_1-error:0.09145 validation_0-logloss:0.36749 validation_0-error:0.06977 validation_1-logloss:0.37917 validation 1-error:0.09145 [15] validation_0-logloss:0.35601 validation_0-error:0.05851 validation_1-logloss:0.36811 validation_1-error:0.07196 validation_0-logloss:0.34464 validation 0-error:0.05701 [16] validation_1-logloss:0.35673 validation_1-error:0.07346 validation 0-logloss:0.33419 validation 0-error:0.05701 [17] 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 validation_0-logloss:0.31505 [19] validation_0-error:0.05589 validation_1-logloss:0.32676 validation_1-error:0.07346 [20] validation_0-logloss:0.30542 validation_0-error:0.05439 validation_1-logloss:0.31766 validation_1-error:0.07196 validation_0-logloss:0.29653 [21] validation_0-error:0.05401

```
validation_1-logloss:0.30927
                                 validation_1-error:0.07046
[22]
        validation_0-logloss:0.28834
                                         validation_0-error:0.05401
validation_1-logloss:0.30129
                                 validation_1-error:0.07046
[23]
        validation_0-logloss:0.28067
                                         validation_0-error:0.05439
validation 1-logloss:0.29414
                                 validation 1-error:0.07046
        validation 0-logloss:0.27344
                                         validation 0-error:0.05251
[24]
                                 validation_1-error:0.07046
validation 1-logloss:0.28699
[25]
        validation_0-logloss:0.26659
                                         validation 0-error:0.05251
validation 1-logloss:0.28075
                                 validation 1-error:0.07046
[26]
        validation_0-logloss:0.26030
                                         validation_0-error:0.04951
validation_1-logloss:0.27468
                                 validation_1-error:0.06297
[27]
        validation_0-logloss:0.25450
                                         validation_0-error:0.04989
validation_1-logloss:0.26879
                                 validation_1-error:0.06297
        validation_0-logloss:0.24882
                                         validation_0-error:0.04876
[28]
validation_1-logloss:0.26368
                                 validation_1-error:0.06297
[29]
        validation_0-logloss:0.24354
                                         validation_0-error:0.04839
validation_1-logloss:0.25865
                                 validation_1-error:0.06147
[30]
        validation_0-logloss:0.23873
                                         validation_0-error:0.04464
validation_1-logloss:0.25447
                                 validation 1-error:0.06297
Γ317
        validation 0-logloss:0.23403
                                         validation 0-error:0.04239
                                 validation 1-error:0.05997
validation 1-logloss:0.25005
        validation 0-logloss:0.22954
[32]
                                         validation 0-error:0.04163
validation_1-logloss:0.24580
                                 validation_1-error:0.06147
        validation 0-logloss:0.22554
                                         validation_0-error:0.04088
[33]
validation_1-logloss:0.24242
                                 validation_1-error:0.05997
        validation_0-logloss:0.22159
                                         validation_0-error:0.04051
[34]
validation_1-logloss:0.23898
                                 validation_1-error:0.05697
        validation_0-logloss:0.21776
[35]
                                         validation_0-error:0.04051
validation_1-logloss:0.23507
                                 validation 1-error:0.05697
[36]
        validation_0-logloss:0.21411
                                         validation_0-error:0.04051
validation_1-logloss:0.23179
                                 validation_1-error:0.05697
        validation_0-logloss:0.21084
[37]
                                         validation_0-error:0.04013
validation_1-logloss:0.22856
                                 validation_1-error:0.05697
[38]
        validation_0-logloss:0.20768
                                         validation_0-error:0.03976
validation 1-logloss:0.22561
                                 validation 1-error:0.05697
        validation 0-logloss:0.20461
[39]
                                         validation 0-error:0.04013
validation 1-logloss:0.22282
                                 validation 1-error:0.05547
Γ401
        validation_0-logloss:0.20187
                                         validation 0-error:0.03939
validation_1-logloss:0.22050
                                 validation_1-error:0.05547
[41]
        validation_0-logloss:0.19913
                                         validation 0-error:0.03939
validation_1-logloss:0.21802
                                 validation_1-error:0.05547
[42]
        validation_0-logloss:0.19652
                                         validation_0-error:0.03939
validation_1-logloss:0.21586
                                 validation_1-error:0.05547
        validation_0-logloss:0.19407
                                         validation_0-error:0.04051
[43]
validation_1-logloss:0.21354
                                 validation_1-error:0.05397
        validation_0-logloss:0.19184
                                         validation_0-error:0.03939
validation_1-logloss:0.21123
                                 validation_1-error:0.05547
[45]
        validation_0-logloss:0.18973
                                         validation_0-error:0.03939
```

```
validation_1-logloss:0.20944
                                 validation_1-error:0.05547
[46]
        validation_0-logloss:0.18741
                                         validation_0-error:0.03976
validation_1-logloss:0.20742
                                 validation_1-error:0.05547
[47]
        validation_0-logloss:0.18535
                                         validation_0-error:0.03976
validation 1-logloss:0.20565
                                 validation 1-error:0.05397
        validation 0-logloss:0.18309
                                         validation 0-error:0.03976
[48]
validation 1-logloss:0.20416
                                 validation 1-error:0.05397
[49]
        validation_0-logloss:0.18136
                                         validation 0-error:0.03901
validation 1-logloss:0.20250
                                 validation 1-error:0.05397
                                         validation_0-error:0.03939
[50]
        validation_0-logloss:0.17930
validation_1-logloss:0.20093
                                 validation_1-error:0.05247
[51]
        validation_0-logloss:0.17721
                                         validation_0-error:0.03826
validation_1-logloss:0.19861
                                 validation_1-error:0.05097
        validation_0-logloss:0.17546
                                         validation_0-error:0.03864
[52]
validation_1-logloss:0.19699
                                 validation_1-error:0.05097
[53]
        validation_0-logloss:0.17358
                                         validation_0-error:0.03864
validation_1-logloss:0.19459
                                 validation_1-error:0.05097
[54]
        validation_0-logloss:0.17196
                                         validation_0-error:0.03751
validation_1-logloss:0.19310
                                 validation 1-error:0.05097
[55]
        validation 0-logloss:0.17064
                                         validation 0-error:0.03751
                                 validation 1-error:0.05097
validation 1-logloss:0.19164
        validation 0-logloss:0.16921
                                         validation 0-error:0.03713
[56]
validation_1-logloss:0.19037
                                 validation 1-error:0.05097
        validation_0-logloss:0.16765
                                         validation_0-error:0.03713
[57]
validation_1-logloss:0.18860
                                 validation_1-error:0.05097
        validation_0-logloss:0.16621
                                         validation_0-error:0.03713
[58]
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
        validation_0-logloss:0.16480
[59]
                                         validation_0-error:0.03713
validation_1-logloss:0.18617
                                 validation 1-error:0.05097
[60]
        validation_0-logloss:0.16348
                                         validation_0-error:0.03676
validation_1-logloss:0.18509
                                 validation_1-error:0.05097
        validation_0-logloss:0.16223
                                         validation_0-error:0.03676
validation_1-logloss:0.18418
                                 validation_1-error:0.05097
[62]
        validation_0-logloss:0.16110
                                         validation_0-error:0.03638
validation 1-logloss:0.18267
                                 validation 1-error:0.05097
        validation 0-logloss:0.15998
[63]
                                         validation 0-error:0.03676
validation 1-logloss:0.18175
                                 validation 1-error:0.04947
[64]
        validation_0-logloss:0.15883
                                         validation 0-error:0.03601
validation_1-logloss:0.18082
                                 validation_1-error:0.04798
        validation_0-logloss:0.15795
[65]
                                         validation 0-error:0.03563
validation_1-logloss:0.18012
                                 validation_1-error:0.04798
        validation_0-logloss:0.15687
                                         validation_0-error:0.03601
[66]
validation_1-logloss:0.17883
                                 validation_1-error:0.04798
        validation_0-logloss:0.15609
                                         validation_0-error:0.03488
[67]
validation_1-logloss:0.17856
                                 validation_1-error:0.04798
[68]
        validation_0-logloss:0.15507
                                         validation_0-error:0.03488
validation_1-logloss:0.17725
                                 validation_1-error:0.04798
[69]
        validation_0-logloss:0.15429
                                         validation_0-error:0.03488
```

```
validation_1-logloss:0.17697
                                 validation_1-error:0.04798
[70]
        validation_0-logloss:0.15332
                                         validation_0-error:0.03526
validation_1-logloss:0.17599
                                 validation_1-error:0.04798
        validation_0-logloss:0.15267
                                         validation_0-error:0.03488
[71]
validation 1-logloss:0.17570
                                 validation 1-error:0.04798
[72]
        validation 0-logloss:0.15174
                                         validation 0-error:0.03451
validation 1-logloss:0.17435
                                 validation 1-error:0.04798
[73]
        validation_0-logloss:0.15083
                                         validation_0-error:0.03451
validation 1-logloss:0.17309
                                 validation 1-error:0.04798
[74]
        validation_0-logloss:0.15016
                                         validation_0-error:0.03451
validation_1-logloss:0.17284
                                 validation_1-error:0.04798
[75]
        validation_0-logloss:0.14928
                                         validation_0-error:0.03451
validation_1-logloss:0.17196
                                 validation_1-error:0.04798
        validation_0-logloss:0.14871
                                         validation_0-error:0.03413
[76]
validation_1-logloss:0.17204
                                 validation_1-error:0.04798
[77]
        validation_0-logloss:0.14795
                                         validation_0-error:0.03413
validation_1-logloss:0.17132
                                 validation_1-error:0.04947
[78]
        validation_0-logloss:0.14737
                                         validation_0-error:0.03413
validation_1-logloss:0.17114
                                 validation 1-error:0.04947
[79]
        validation 0-logloss:0.14669
                                         validation 0-error:0.03413
validation 1-logloss:0.17029
                                 validation 1-error:0.04798
        validation 0-logloss:0.14611
[80]
                                         validation 0-error:0.03413
validation_1-logloss:0.17022
                                 validation_1-error:0.04798
        validation_0-logloss:0.14574
                                         validation_0-error:0.03413
[81]
validation_1-logloss:0.17006
                                 validation_1-error:0.04798
[82]
        validation_0-logloss:0.14505
                                         validation_0-error:0.03413
validation_1-logloss:0.16938
                                 validation_1-error:0.04648
        validation_0-logloss:0.14425
[83]
                                         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
        validation_0-logloss:0.14320
[85]
                                         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
validation 1-logloss:0.16814
                                 validation 1-error:0.04648
        validation 0-logloss:0.14195
[87]
                                         validation 0-error:0.03413
validation 1-logloss:0.16773
                                 validation 1-error:0.04648
[88]
        validation_0-logloss:0.14165
                                         validation 0-error:0.03413
validation_1-logloss:0.16767
                                 validation_1-error:0.04648
        validation_0-logloss:0.14115
[89]
                                         validation 0-error:0.03376
validation_1-logloss:0.16780
                                 validation_1-error:0.04648
        validation_0-logloss:0.65651
                                         validation_0-error:0.07277
[0]
validation_1-logloss:0.65742
                                 validation_1-error:0.08995
        validation_0-logloss:0.62335
                                         validation_0-error:0.06789
[1]
validation_1-logloss:0.62519
                                 validation_1-error:0.08546
        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
        validation_0-logloss:0.54010
                                         validation_0-error:0.05664
[4]
validation_1-logloss:0.54368
                                 validation_1-error:0.06597
        validation_0-logloss:0.51683
                                         validation_0-error:0.06789
[5]
validation 1-logloss:0.52120
                                 validation 1-error:0.08546
        validation 0-logloss:0.49530
                                         validation 0-error:0.05664
validation 1-logloss:0.50006
                                 validation 1-error:0.06597
[7]
        validation_0-logloss:0.47549
                                         validation 0-error:0.05664
validation 1-logloss:0.48077
                                 validation 1-error:0.06597
                                         validation_0-error:0.05664
        validation_0-logloss:0.45711
validation_1-logloss:0.46288
                                 validation_1-error:0.06597
[9]
        validation_0-logloss:0.44010
                                         validation_0-error:0.05664
validation_1-logloss:0.44638
                                 validation_1-error:0.06597
        validation_0-logloss:0.42426
                                         validation_0-error:0.05626
validation_1-logloss:0.43083
                                 validation_1-error:0.06597
[11]
        validation_0-logloss:0.40960
                                         validation_0-error:0.05626
validation_1-logloss:0.41696
                                 validation_1-error:0.06597
[12]
        validation_0-logloss:0.39566
                                         validation_0-error:0.05626
validation_1-logloss:0.40292
                                 validation 1-error:0.06597
Γ13]
        validation 0-logloss:0.38262
                                         validation 0-error:0.05551
validation 1-logloss:0.39058
                                 validation 1-error:0.06597
        validation 0-logloss:0.36938
                                         validation 0-error:0.05551
[14]
validation_1-logloss:0.37747
                                 validation_1-error:0.06597
        validation_0-logloss:0.35702
                                         validation_0-error:0.05551
[15]
validation_1-logloss:0.36533
                                 validation_1-error:0.06597
        validation_0-logloss:0.34544
                                         validation_0-error:0.05551
[16]
validation_1-logloss:0.35374
                                 validation_1-error:0.06597
        validation_0-logloss:0.33464
                                         validation_0-error:0.05589
[17]
validation_1-logloss:0.34352
                                 validation 1-error:0.06747
[18]
        validation_0-logloss:0.32461
                                         validation_0-error:0.05551
validation_1-logloss:0.33363
                                 validation_1-error:0.06747
[19]
        validation_0-logloss:0.31518
                                         validation_0-error:0.05514
validation_1-logloss:0.32474
                                 validation_1-error:0.06897
[20]
        validation_0-logloss:0.30631
                                         validation_0-error:0.05514
validation 1-logloss:0.31585
                                 validation 1-error:0.06897
        validation 0-logloss:0.29760
[21]
                                         validation 0-error:0.05439
validation 1-logloss:0.30752
                                 validation 1-error:0.06597
[22]
        validation_0-logloss:0.28952
                                         validation 0-error:0.04839
validation_1-logloss:0.29954
                                 validation_1-error:0.06147
        validation_0-logloss:0.28192
[23]
                                         validation 0-error:0.04539
validation_1-logloss:0.29195
                                 validation_1-error:0.05847
        validation_0-logloss:0.27477
[24]
                                         validation_0-error:0.04539
validation_1-logloss:0.28516
                                 validation_1-error:0.05847
[25]
        validation_0-logloss:0.26789
                                         validation_0-error:0.04501
validation_1-logloss:0.27868
                                 validation_1-error:0.05697
[26]
        validation_0-logloss:0.26153
                                         validation_0-error:0.04389
validation_1-logloss:0.27269
                                 validation_1-error:0.05697
[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
                                         validation_0-error:0.04239
[32]
        validation_0-logloss:0.22982
validation_1-logloss:0.24230
                                 validation_1-error:0.05697
[33]
        validation_0-logloss:0.22560
                                         validation_0-error:0.04276
validation_1-logloss:0.23813
                                 validation_1-error:0.05697
        validation_0-logloss:0.22154
                                         validation_0-error:0.04201
[34]
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
        validation 0-logloss:0.20733
[38]
                                         validation 0-error:0.03901
validation_1-logloss:0.22083
                                 validation_1-error:0.05397
        validation 0-logloss:0.20404
                                         validation_0-error:0.03976
[39]
validation_1-logloss:0.21775
                                 validation_1-error:0.05397
        validation_0-logloss:0.20110
                                         validation_0-error:0.03976
[40]
validation_1-logloss:0.21456
                                 validation_1-error:0.05247
        validation_0-logloss:0.19834
[41]
                                         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
        validation_0-logloss:0.19300
[43]
                                         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
        validation 0-logloss:0.18830
[45]
                                         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
        validation_0-logloss:0.18350
[47]
                                         validation_0-error:0.03788
validation_1-logloss:0.19772
                                 validation_1-error:0.04947
        validation_0-logloss:0.18100
                                         validation_0-error:0.03751
[48]
validation_1-logloss:0.19472
                                 validation_1-error:0.05097
        validation_0-logloss:0.17932
                                         validation_0-error:0.03676
[49]
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
```

```
validation_1-logloss:0.18963
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17353
                                         validation_0-error:0.03601
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
        validation_0-logloss:0.17172
                                         validation_0-error:0.03638
[53]
validation 1-logloss:0.18606
                                 validation 1-error:0.05097
        validation_0-logloss:0.17038
                                         validation 0-error:0.03638
[54]
                                 validation_1-error:0.05097
validation 1-logloss:0.18542
[55]
        validation_0-logloss:0.16875
                                         validation_0-error:0.03638
validation 1-logloss:0.18403
                                 validation 1-error:0.05097
                                         validation_0-error:0.03676
[56]
        validation_0-logloss:0.16720
validation_1-logloss:0.18254
                                 validation_1-error:0.05097
[57]
        validation_0-logloss:0.16582
                                         validation_0-error:0.03676
validation_1-logloss:0.18126
                                 validation_1-error:0.05097
        validation_0-logloss:0.16482
                                         validation_0-error:0.03676
[58]
validation_1-logloss:0.18080
                                 validation_1-error:0.04947
[59]
        validation_0-logloss:0.16354
                                         validation_0-error:0.03676
validation_1-logloss:0.17999
                                 validation_1-error:0.04947
[60]
        validation_0-logloss:0.16225
                                         validation_0-error:0.03676
validation_1-logloss:0.17897
                                 validation 1-error:0.04947
Γ61]
        validation 0-logloss:0.16134
                                         validation 0-error:0.03713
validation 1-logloss:0.17849
                                 validation 1-error:0.04947
        validation 0-logloss:0.16050
[62]
                                         validation 0-error:0.03713
validation_1-logloss:0.17793
                                 validation_1-error:0.04947
        validation_0-logloss:0.15937
                                         validation 0-error:0.03676
[63]
validation_1-logloss:0.17710
                                 validation_1-error:0.04947
[64]
        validation_0-logloss:0.15855
                                         validation_0-error:0.03638
validation_1-logloss:0.17649
                                 validation_1-error:0.04947
        validation_0-logloss:0.15790
[65]
                                         validation_0-error:0.03601
validation_1-logloss:0.17627
                                 validation 1-error:0.04947
[66]
        validation_0-logloss:0.15723
                                         validation_0-error:0.03601
validation_1-logloss:0.17582
                                 validation_1-error:0.04947
        validation_0-logloss:0.15668
[67]
                                         validation_0-error:0.03601
validation_1-logloss:0.17589
                                 validation_1-error:0.04947
        validation_0-logloss:0.15559
                                         validation_0-error:0.03563
[68]
validation 1-logloss:0.17503
                                 validation 1-error:0.04947
        validation 0-logloss:0.15493
[69]
                                         validation 0-error:0.03563
validation 1-logloss:0.17435
                                 validation 1-error:0.04947
[70]
        validation_0-logloss:0.15425
                                         validation 0-error:0.03563
validation_1-logloss:0.17393
                                 validation_1-error:0.04798
[71]
        validation_0-logloss:0.15370
                                         validation_0-error:0.03563
validation_1-logloss:0.17341
                                 validation_1-error:0.04798
[72]
        validation_0-logloss:0.15274
                                         validation_0-error:0.03563
validation_1-logloss:0.17284
                                 validation_1-error:0.04798
        validation_0-logloss:0.15214
                                         validation_0-error:0.03563
[73]
validation_1-logloss:0.17253
                                 validation_1-error:0.04798
[74]
        validation_0-logloss:0.15161
                                         validation_0-error:0.03563
validation_1-logloss:0.17220
                                 validation_1-error:0.04798
[75]
        validation_0-logloss:0.15066
                                         validation_0-error:0.03526
```

```
validation_1-logloss:0.17171
                                validation_1-error:0.04798
        validation_0-logloss:0.15021
                                         validation_0-error:0.03526
[76]
validation_1-logloss:0.17161
                                validation_1-error:0.04798
        validation 0-logloss:0.14973
                                         validation_0-error:0.03526
[77]
validation 1-logloss:0.17135
                                validation 1-error:0.04798
        validation 0-logloss:0.14912
                                         validation 0-error:0.03451
[78]
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
[80]
        validation_0-logloss:0.14787
                                         validation_0-error:0.03451
validation_1-logloss:0.17088
                                validation_1-error:0.04648
        validation_0-logloss:0.14705
                                         validation_0-error:0.03451
[81]
validation_1-logloss:0.17072
                                validation_1-error:0.04648
        validation_0-logloss:0.14604
                                        validation_0-error:0.03451
[82]
validation_1-logloss:0.16944
                                validation_1-error:0.04648
        validation_0-logloss:0.14564
                                         validation_0-error:0.03451
[83]
validation_1-logloss:0.16945
                                validation_1-error:0.04648
        validation_0-logloss:0.14523
                                         validation_0-error:0.03451
[84]
validation 1-logloss:0.16924
                                validation 1-error:0.04648
        validation 0-logloss:0.14453
                                         validation 0-error:0.03451
[85]
validation 1-logloss:0.16885
                                validation 1-error:0.04648
        validation 0-logloss:0.14361
[86]
                                         validation 0-error:0.03451
validation_1-logloss:0.16779
                                validation_1-error:0.04648
        validation_0-logloss:0.14338
                                         validation_0-error:0.03451
[87]
validation_1-logloss:0.16773
                                validation_1-error:0.04648
        validation_0-logloss:0.14253
                                         validation_0-error:0.03413
[88]
                                validation_1-error:0.04498
validation_1-logloss:0.16684
        validation_0-logloss:0.14228
[89]
                                         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)
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:0.65660
                                        validation_0-error:0.07277
validation_1-logloss:0.65761
                                validation 1-error:0.08546
        validation_0-logloss:0.62351
[1]
                                         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
        validation_0-logloss:0.54028
                                         validation_0-error:0.05851
[4]
validation_1-logloss:0.54405
                                 validation 1-error:0.06897
        validation 0-logloss:0.51705
                                         validation 0-error:0.05889
[5]
validation 1-logloss:0.52141
                                 validation 1-error:0.06897
        validation 0-logloss:0.49546
                                         validation 0-error:0.05851
validation_1-logloss:0.50043
                                 validation 1-error:0.06897
        validation_0-logloss:0.47571
                                         validation 0-error:0.05851
validation_1-logloss:0.48110
                                 validation_1-error:0.06897
        validation_0-logloss:0.45725
[8]
                                         validation_0-error:0.05851
validation_1-logloss:0.46312
                                 validation_1-error:0.06897
        validation_0-logloss:0.44024
                                         validation_0-error:0.05851
validation_1-logloss:0.44673
                                 validation_1-error:0.06897
        validation_0-logloss:0.42433
[10]
                                         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
validation_1-logloss:0.41709
                                 validation_1-error:0.06897
[12]
        validation_0-logloss:0.39581
                                         validation_0-error:0.05664
validation 1-logloss:0.40411
                                 validation 1-error:0.07046
                                         validation 0-error:0.05664
        validation_0-logloss:0.38299
validation 1-logloss:0.39141
                                 validation 1-error:0.07046
        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
        validation_0-logloss:0.34820
                                         validation_0-error:0.05626
[16]
validation_1-logloss:0.35758
                                 validation_1-error:0.07046
        validation_0-logloss:0.33723
                                         validation_0-error:0.05626
[17]
validation_1-logloss:0.34653
                                 validation_1-error:0.07046
[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
        validation 0-logloss:0.30785
                                         validation 0-error:0.05439
[20]
validation 1-logloss:0.31774
                                 validation 1-error:0.06747
        validation 0-logloss:0.29898
                                         validation 0-error:0.05364
[21]
validation_1-logloss:0.30898
                                 validation 1-error:0.06747
        validation_0-logloss:0.29068
                                         validation_0-error:0.05364
[22]
validation_1-logloss:0.30091
                                 validation 1-error:0.06747
        validation_0-logloss:0.28295
                                         validation_0-error:0.05514
[23]
validation_1-logloss:0.29356
                                 validation_1-error:0.06747
[24]
        validation_0-logloss:0.27570
                                         validation_0-error:0.05064
                                 validation_1-error:0.06297
validation_1-logloss:0.28654
        validation_0-logloss:0.26886
[25]
                                         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
validation_1-logloss:0.26737
                                 validation_1-error:0.05847
        validation_0-logloss:0.25057
                                         validation_0-error:0.04389
[28]
validation_1-logloss:0.26215
                                 validation 1-error:0.05547
        validation 0-logloss:0.24520
                                         validation 0-error:0.04201
[29]
validation 1-logloss:0.25676
                                 validation 1-error:0.05547
        validation 0-logloss:0.24012
                                         validation 0-error:0.04239
validation_1-logloss:0.25193
                                 validation 1-error:0.05547
        validation_0-logloss:0.23537
                                         validation 0-error:0.04163
[31]
validation_1-logloss:0.24732
                                 validation_1-error:0.05397
        validation_0-logloss:0.23098
                                         validation_0-error:0.04088
[32]
validation_1-logloss:0.24277
                                 validation_1-error:0.05247
        validation_0-logloss:0.22665
[33]
                                         validation_0-error:0.04013
validation_1-logloss:0.23872
                                 validation_1-error:0.04947
        validation_0-logloss:0.22243
[34]
                                         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
validation 1-logloss:0.22645
                                 validation 1-error:0.04798
        validation_0-logloss:0.21108
                                         validation 0-error:0.03788
validation 1-logloss:0.22352
                                 validation 1-error:0.04798
        validation_0-logloss:0.20779
                                         validation_0-error:0.03788
validation_1-logloss:0.21986
                                 validation 1-error:0.04648
[39]
        validation_0-logloss:0.20456
                                         validation_0-error:0.03826
validation_1-logloss:0.21682
                                 validation_1-error:0.04798
[40]
        validation_0-logloss:0.20171
                                         validation_0-error:0.03788
validation_1-logloss:0.21441
                                 validation_1-error:0.04648
        validation_0-logloss:0.19841
                                         validation_0-error:0.03713
[41]
validation_1-logloss:0.21052
                                 validation_1-error:0.04348
[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
        validation 0-logloss:0.19008
                                         validation 0-error:0.03563
[44]
validation 1-logloss:0.20206
                                 validation 1-error:0.04498
        validation 0-logloss:0.18789
                                         validation 0-error:0.03601
[45]
validation_1-logloss:0.20031
                                 validation 1-error:0.04348
        validation_0-logloss:0.18526
                                         validation_0-error:0.03526
[46]
validation_1-logloss:0.19755
                                 validation 1-error:0.04348
        validation_0-logloss:0.18284
                                         validation_0-error:0.03526
[47]
validation_1-logloss:0.19452
                                 validation_1-error:0.04348
[48]
        validation_0-logloss:0.18089
                                         validation_0-error:0.03488
validation_1-logloss:0.19283
                                 validation 1-error:0.04498
        validation_0-logloss:0.17875
[49]
                                         validation_0-error:0.03488
validation_1-logloss:0.19091
                                 validation_1-error:0.04498
[50]
        validation_0-logloss:0.17659
                                         validation_0-error:0.03488
validation_1-logloss:0.18861
                                 validation_1-error:0.04348
```

```
[51]
        validation_0-logloss:0.17471
                                         validation_0-error:0.03526
validation_1-logloss:0.18696
                                 validation_1-error:0.04348
        validation_0-logloss:0.17282
[52]
                                         validation_0-error:0.03488
validation_1-logloss:0.18448
                                 validation 1-error:0.04348
        validation 0-logloss:0.17106
                                         validation 0-error:0.03488
[53]
validation 1-logloss:0.18295
                                 validation 1-error:0.04048
        validation 0-logloss:0.16928
                                         validation 0-error:0.03526
validation_1-logloss:0.18091
                                 validation 1-error:0.03898
        validation_0-logloss:0.16761
                                         validation 0-error:0.03488
[55]
validation_1-logloss:0.17945
                                 validation_1-error:0.04048
        validation_0-logloss:0.16630
                                         validation_0-error:0.03488
[56]
validation_1-logloss:0.17847
                                 validation_1-error:0.04198
        validation_0-logloss:0.16503
[57]
                                         validation_0-error:0.03413
validation_1-logloss:0.17715
                                 validation 1-error:0.04048
        validation_0-logloss:0.16382
[58]
                                         validation_0-error:0.03413
validation_1-logloss:0.17645
                                 validation_1-error:0.04048
[59]
        validation_0-logloss:0.16232
                                         validation_0-error:0.03376
validation_1-logloss:0.17444
                                 validation_1-error:0.03898
[60]
        validation_0-logloss:0.16120
                                         validation_0-error:0.03413
validation 1-logloss:0.17365
                                 validation 1-error:0.03748
        validation_0-logloss:0.15983
                                         validation 0-error:0.03338
validation 1-logloss:0.17180
                                 validation 1-error:0.03748
[62]
        validation_0-logloss:0.15873
                                         validation_0-error:0.03338
validation_1-logloss:0.17120
                                 validation_1-error:0.03748
[63]
        validation_0-logloss:0.15754
                                         validation_0-error:0.03338
validation_1-logloss:0.16954
                                 validation_1-error:0.03598
        validation_0-logloss:0.15660
                                         validation_0-error:0.03301
[64]
validation_1-logloss:0.16865
                                 validation_1-error:0.03748
[65]
        validation_0-logloss:0.15551
                                         validation_0-error:0.03338
validation_1-logloss:0.16726
                                 validation_1-error:0.03598
[66]
        validation_0-logloss:0.15449
                                         validation_0-error:0.03338
validation_1-logloss:0.16655
                                 validation_1-error:0.03598
[67]
        validation_0-logloss:0.15354
                                         validation_0-error:0.03301
validation 1-logloss:0.16563
                                 validation 1-error:0.03598
        validation 0-logloss:0.15267
                                         validation 0-error:0.03263
validation 1-logloss:0.16470
                                 validation 1-error:0.03598
        validation 0-logloss:0.15201
                                         validation 0-error:0.03226
[69]
validation_1-logloss:0.16424
                                 validation 1-error:0.03598
        validation_0-logloss:0.15091
                                         validation_0-error:0.03113
[70]
validation_1-logloss:0.16286
                                 validation 1-error:0.03298
        validation_0-logloss:0.14993
                                         validation_0-error:0.03113
[71]
validation_1-logloss:0.16206
                                 validation_1-error:0.03148
[72]
        validation_0-logloss:0.14948
                                         validation_0-error:0.03113
validation_1-logloss:0.16152
                                 validation 1-error:0.03298
        validation_0-logloss:0.14888
[73]
                                         validation_0-error:0.03113
validation_1-logloss:0.16121
                                 validation_1-error:0.03148
[74]
        validation_0-logloss:0.14841
                                         validation_0-error:0.03113
validation_1-logloss:0.16084
                                 validation_1-error:0.03148
```

```
[75]
        validation_0-logloss:0.14767
                                         validation_0-error:0.03113
validation_1-logloss:0.16027
                                 validation_1-error:0.03148
        validation_0-logloss:0.14669
[76]
                                         validation_0-error:0.03113
validation_1-logloss:0.15951
                                 validation 1-error:0.03298
        validation 0-logloss:0.14611
                                         validation 0-error:0.03038
[77]
validation 1-logloss:0.15937
                                 validation 1-error:0.03298
        validation 0-logloss:0.14530
                                         validation 0-error:0.03038
validation_1-logloss:0.15875
                                 validation 1-error:0.03298
[79]
        validation_0-logloss:0.14441
                                         validation 0-error:0.03038
validation_1-logloss:0.15832
                                 validation_1-error:0.03298
        validation_0-logloss:0.14402
                                         validation_0-error:0.03001
[80]
validation_1-logloss:0.15814
                                 validation_1-error:0.03298
        validation_0-logloss:0.14335
[81]
                                         validation_0-error:0.03001
validation_1-logloss:0.15750
                                 validation 1-error:0.03298
        validation_0-logloss:0.14284
[82]
                                         validation_0-error:0.03001
validation_1-logloss:0.15750
                                 validation_1-error:0.03298
[83]
        validation_0-logloss:0.14203
                                         validation_0-error:0.02963
validation_1-logloss:0.15722
                                 validation_1-error:0.03298
[84]
        validation_0-logloss:0.14146
                                         validation_0-error:0.02963
validation 1-logloss:0.15674
                                 validation 1-error:0.03298
        validation_0-logloss:0.14116
                                         validation 0-error:0.02963
validation 1-logloss:0.15635
                                 validation 1-error:0.03298
        validation_0-logloss:0.14048
                                         validation_0-error:0.03038
validation_1-logloss:0.15589
                                 validation_1-error:0.03298
[87]
        validation_0-logloss:0.13969
                                         validation_0-error:0.03038
validation_1-logloss:0.15572
                                 validation_1-error:0.03298
        validation_0-logloss:0.13948
                                         validation_0-error:0.03038
[88]
validation_1-logloss:0.15563
                                 validation_1-error:0.03298
[89]
        validation_0-logloss:0.13897
                                         validation 0-error:0.03038
validation_1-logloss:0.15514
                                 validation_1-error:0.03298
[90]
        validation_0-logloss:0.13819
                                         validation_0-error:0.03001
                                 validation_1-error:0.03298
validation_1-logloss:0.15498
[91]
        validation_0-logloss:0.13767
                                         validation_0-error:0.03038
validation 1-logloss:0.15449
                                 validation 1-error:0.03448
        validation 0-logloss:0.13692
                                         validation 0-error:0.03038
validation 1-logloss:0.15419
                                 validation 1-error:0.03448
        validation 0-logloss:0.13669
                                         validation 0-error:0.03038
[93]
validation_1-logloss:0.15409
                                 validation 1-error:0.03448
        validation_0-logloss:0.13623
                                         validation_0-error:0.03038
[94]
validation_1-logloss:0.15365
                                 validation 1-error:0.03448
        validation_0-logloss:0.13554
                                         validation_0-error:0.03038
[95]
validation_1-logloss:0.15364
                                 validation_1-error:0.03448
[96]
        validation_0-logloss:0.13518
                                         validation_0-error:0.03076
validation_1-logloss:0.15377
                                 validation 1-error:0.03448
        validation_0-logloss:0.13478
[97]
                                         validation_0-error:0.03113
validation_1-logloss:0.15335
                                 validation_1-error:0.03448
[98]
        validation_0-logloss:0.13445
                                         validation_0-error:0.03076
validation_1-logloss:0.15332
                                 validation_1-error:0.03448
```

```
[99]
        validation_0-logloss:0.13381
                                         validation_0-error:0.03076
validation_1-logloss:0.15297
                                 validation_1-error:0.03448
        validation_0-logloss:0.13358
[100]
                                         validation_0-error:0.03076
validation 1-logloss:0.15281
                                 validation 1-error:0.03448
Γ1017
        validation 0-logloss:0.13334
                                         validation 0-error:0.03076
validation 1-logloss:0.15278
                                 validation 1-error:0.03298
        validation 0-logloss:0.13289
                                         validation 0-error:0.03076
validation_1-logloss:0.15228
                                 validation 1-error:0.03298
        validation_0-logloss:0.13234
                                         validation 0-error:0.03038
[103]
validation_1-logloss:0.15216
                                 validation_1-error:0.03148
        validation_0-logloss:0.13198
                                         validation_0-error:0.03076
[104]
validation_1-logloss:0.15179
                                 validation_1-error:0.03298
        validation_0-logloss:0.13159
[105]
                                         validation_0-error:0.03038
validation_1-logloss:0.15156
                                 validation 1-error:0.03148
        validation_0-logloss:0.13097
[106]
                                         validation_0-error:0.03038
validation_1-logloss:0.15136
                                 validation_1-error:0.03148
[107]
        validation_0-logloss:0.13065
                                         validation_0-error:0.03076
validation_1-logloss:0.15151
                                 validation_1-error:0.03298
[108]
        validation 0-logloss:0.13018
                                         validation_0-error:0.03076
                                 validation_1-error:0.03148
validation 1-logloss:0.15093
Γ1097
        validation 0-logloss:0.12993
                                         validation 0-error:0.03038
validation 1-logloss:0.15081
                                 validation 1-error:0.03148
Γ1107
        validation_0-logloss:0.12976
                                         validation_0-error:0.03076
validation_1-logloss:0.15077
                                 validation 1-error:0.03148
[111]
        validation_0-logloss:0.12933
                                         validation_0-error:0.03076
validation_1-logloss:0.15035
                                 validation_1-error:0.03148
        validation_0-logloss:0.12916
                                         validation_0-error:0.03076
[112]
validation_1-logloss:0.15032
                                 validation_1-error:0.03148
[113]
        validation_0-logloss:0.12890
                                         validation 0-error:0.03076
validation_1-logloss:0.15051
                                 validation_1-error:0.03148
[114]
        validation_0-logloss:0.12852
                                         validation_0-error:0.03076
validation_1-logloss:0.15011
                                 validation_1-error:0.03148
[115]
        validation_0-logloss:0.12833
                                         validation_0-error:0.03076
validation 1-logloss:0.14991
                                 validation 1-error:0.03298
        validation 0-logloss:0.12776
                                         validation 0-error:0.03076
[116]
validation 1-logloss:0.14990
                                 validation 1-error:0.03298
        validation 0-logloss:0.12761
                                         validation 0-error:0.03076
[117]
validation 1-logloss:0.15004
                                 validation 1-error:0.03448
        validation_0-logloss:0.12714
                                         validation_0-error:0.03076
[118]
validation_1-logloss:0.14983
                                 validation 1-error:0.03298
        validation_0-logloss:0.12674
                                         validation_0-error:0.03038
[119]
validation_1-logloss:0.14935
                                 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
        validation_0-logloss:0.62301
[1]
                                         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
        validation_0-logloss:0.53949
                                         validation_0-error:0.05326
[4]
validation_1-logloss:0.54207
                                 validation 1-error:0.06597
        validation 0-logloss:0.51600
                                         validation 0-error:0.06452
[5]
validation 1-logloss:0.51943
                                 validation 1-error:0.07496
        validation 0-logloss:0.49448
                                         validation 0-error:0.05289
validation_1-logloss:0.49825
                                 validation 1-error:0.05847
        validation_0-logloss:0.47437
                                         validation 0-error:0.05251
validation_1-logloss:0.47874
                                 validation_1-error:0.05397
        validation_0-logloss:0.45587
[8]
                                         validation_0-error:0.05251
validation_1-logloss:0.46044
                                 validation_1-error:0.05397
        validation_0-logloss:0.43873
                                         validation_0-error:0.05251
validation_1-logloss:0.44395
                                 validation_1-error:0.05397
        validation_0-logloss:0.42282
[10]
                                         validation_0-error:0.05251
validation_1-logloss:0.42863
                                 validation_1-error:0.05397
[11]
        validation_0-logloss:0.40796
                                         validation_0-error:0.05251
validation_1-logloss:0.41410
                                 validation_1-error:0.05397
[12]
        validation_0-logloss:0.39412
                                         validation_0-error:0.05251
validation 1-logloss:0.40060
                                 validation 1-error:0.05397
        validation_0-logloss:0.38123
                                         validation 0-error:0.05251
validation 1-logloss:0.38834
                                 validation 1-error:0.05397
        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
        validation_0-logloss:0.34634
                                         validation_0-error:0.05364
[16]
validation_1-logloss:0.35275
                                 validation_1-error:0.05847
        validation_0-logloss:0.33598
                                         validation_0-error:0.05364
[17]
validation_1-logloss:0.34220
                                 validation_1-error:0.05847
[18]
        validation_0-logloss:0.32619
                                         validation_0-error:0.05364
validation_1-logloss:0.33253
                                 validation_1-error:0.05697
[19]
        validation_0-logloss:0.31621
                                         validation_0-error:0.05364
validation_1-logloss:0.32277
                                 validation 1-error:0.05547
        validation 0-logloss:0.30685
                                         validation 0-error:0.05401
[20]
validation 1-logloss:0.31383
                                 validation 1-error:0.05847
        validation 0-logloss:0.29816
                                         validation 0-error:0.05401
[21]
validation_1-logloss:0.30530
                                 validation 1-error:0.05847
        validation_0-logloss:0.28995
                                         validation_0-error:0.05326
[22]
validation_1-logloss:0.29697
                                 validation 1-error:0.05697
        validation_0-logloss:0.28238
                                         validation_0-error:0.05289
[23]
validation_1-logloss:0.28959
                                 validation_1-error:0.05397
[24]
        validation_0-logloss:0.27520
                                         validation_0-error:0.05326
                                 validation_1-error:0.05547
validation_1-logloss:0.28299
        validation_0-logloss:0.26848
[25]
                                         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
```

```
[27]
        validation_0-logloss:0.25627
                                         validation_0-error:0.05139
validation_1-logloss:0.26466
                                 validation_1-error:0.04947
        validation_0-logloss:0.25044
                                         validation_0-error:0.05139
[28]
validation_1-logloss:0.25882
                                 validation 1-error:0.04947
        validation 0-logloss:0.24524
                                         validation 0-error:0.04989
[29]
validation 1-logloss:0.25348
                                 validation 1-error:0.04947
        validation 0-logloss:0.24031
                                         validation 0-error:0.04276
validation_1-logloss:0.24868
                                 validation 1-error:0.04498
        validation_0-logloss:0.23569
                                         validation 0-error:0.04314
[31]
validation_1-logloss:0.24416
                                 validation_1-error:0.04648
        validation_0-logloss:0.23107
                                         validation_0-error:0.04389
[32]
validation_1-logloss:0.24003
                                 validation_1-error:0.04798
        validation_0-logloss:0.22665
                                         validation_0-error:0.04389
[33]
validation_1-logloss:0.23598
                                 validation 1-error:0.04798
        validation_0-logloss:0.22258
[34]
                                         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
                                         validation 0-error:0.04239
        validation_0-logloss:0.21097
validation 1-logloss:0.22071
                                 validation 1-error:0.04798
        validation_0-logloss:0.20745
                                         validation_0-error:0.04088
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
[40]
        validation_0-logloss:0.20135
                                         validation_0-error:0.04088
validation_1-logloss:0.21103
                                 validation_1-error:0.04648
[41]
        validation_0-logloss:0.19809
                                         validation 0-error:0.04088
validation_1-logloss:0.20724
                                 validation_1-error:0.04648
[42]
        validation_0-logloss:0.19538
                                         validation_0-error:0.04088
validation_1-logloss:0.20480
                                 validation_1-error:0.04648
[43]
        validation_0-logloss:0.19282
                                         validation_0-error:0.04051
validation 1-logloss:0.20266
                                 validation 1-error:0.04498
        validation 0-logloss:0.19022
                                         validation 0-error:0.03939
[44]
validation 1-logloss:0.19973
                                 validation 1-error:0.04348
        validation 0-logloss:0.18790
                                         validation 0-error:0.03939
[45]
validation_1-logloss:0.19771
                                 validation 1-error:0.04348
        validation_0-logloss:0.18535
                                         validation_0-error:0.03901
[46]
validation_1-logloss:0.19451
                                 validation 1-error:0.04348
        validation_0-logloss:0.18329
                                         validation_0-error:0.03901
[47]
validation_1-logloss:0.19288
                                 validation_1-error:0.04348
[48]
        validation_0-logloss:0.18098
                                         validation_0-error:0.03901
validation_1-logloss:0.19016
                                 validation 1-error:0.04348
        validation_0-logloss:0.17901
[49]
                                         validation_0-error:0.03939
validation_1-logloss:0.18861
                                 validation_1-error:0.04348
[50]
        validation_0-logloss:0.17709
                                         validation_0-error:0.03864
validation_1-logloss:0.18636
                                 validation_1-error:0.04348
```

```
[51]
        validation_0-logloss:0.17550
                                         validation_0-error:0.03901
validation_1-logloss:0.18495
                                 validation_1-error:0.04348
        validation_0-logloss:0.17390
[52]
                                         validation_0-error:0.03864
validation_1-logloss:0.18339
                                 validation 1-error:0.04348
        validation 0-logloss:0.17223
                                         validation 0-error:0.03826
[53]
validation 1-logloss:0.18158
                                 validation 1-error:0.04348
        validation 0-logloss:0.17064
                                         validation 0-error:0.03826
validation_1-logloss:0.17995
                                 validation 1-error:0.04348
        validation_0-logloss:0.16922
                                         validation 0-error:0.03788
[55]
validation_1-logloss:0.17907
                                 validation_1-error:0.04348
        validation_0-logloss:0.16780
                                         validation_0-error:0.03826
[56]
validation_1-logloss:0.17750
                                 validation_1-error:0.04348
        validation_0-logloss:0.16632
[57]
                                         validation_0-error:0.03713
validation_1-logloss:0.17639
                                 validation 1-error:0.04198
        validation_0-logloss:0.16505
[58]
                                         validation_0-error:0.03713
validation_1-logloss:0.17517
                                 validation_1-error:0.04198
[59]
        validation_0-logloss:0.16364
                                         validation_0-error:0.03713
validation_1-logloss:0.17399
                                 validation_1-error:0.04198
[60]
        validation_0-logloss:0.16243
                                         validation_0-error:0.03638
validation 1-logloss:0.17303
                                 validation 1-error:0.04198
        validation_0-logloss:0.16115
                                         validation 0-error:0.03563
validation 1-logloss:0.17214
                                 validation 1-error:0.04198
[62]
        validation_0-logloss:0.16005
                                         validation_0-error:0.03638
validation 1-logloss:0.17123
                                 validation_1-error:0.04198
[63]
        validation_0-logloss:0.15883
                                         validation_0-error:0.03638
validation_1-logloss:0.17086
                                 validation_1-error:0.04198
        validation_0-logloss:0.15804
                                         validation_0-error:0.03638
[64]
validation_1-logloss:0.17028
                                 validation_1-error:0.04198
[65]
        validation_0-logloss:0.15706
                                         validation_0-error:0.03638
validation_1-logloss:0.16933
                                 validation_1-error:0.04198
[66]
        validation_0-logloss:0.15604
                                         validation_0-error:0.03638
validation_1-logloss:0.16906
                                 validation_1-error:0.04198
[67]
        validation_0-logloss:0.15509
                                         validation_0-error:0.03638
validation 1-logloss:0.16829
                                 validation 1-error:0.04198
        validation 0-logloss:0.15443
                                         validation 0-error:0.03638
validation 1-logloss:0.16780
                                 validation 1-error:0.04198
        validation 0-logloss:0.15353
                                         validation 0-error:0.03601
[69]
validation_1-logloss:0.16695
                                 validation 1-error:0.04198
        validation_0-logloss:0.15293
                                         validation_0-error:0.03601
[70]
validation_1-logloss:0.16646
                                 validation 1-error:0.04048
        validation_0-logloss:0.15213
                                         validation_0-error:0.03601
[71]
validation_1-logloss:0.16605
                                 validation_1-error:0.04048
[72]
        validation_0-logloss:0.15145
                                         validation_0-error:0.03601
validation_1-logloss:0.16570
                                 validation 1-error:0.04048
        validation_0-logloss:0.15087
[73]
                                         validation_0-error:0.03563
validation_1-logloss:0.16501
                                 validation_1-error:0.04048
[74]
        validation_0-logloss:0.15017
                                         validation_0-error:0.03563
validation_1-logloss:0.16470
                                 validation_1-error:0.04048
```

```
[75]
        validation_0-logloss:0.14965
                                         validation_0-error:0.03563
validation_1-logloss:0.16434
                                 validation_1-error:0.04048
        validation_0-logloss:0.14889
[76]
                                         validation_0-error:0.03563
validation_1-logloss:0.16399
                                 validation 1-error:0.04048
        validation 0-logloss:0.14787
                                         validation 0-error:0.03488
[77]
validation 1-logloss:0.16329
                                 validation 1-error:0.04048
        validation 0-logloss:0.14713
                                         validation 0-error:0.03488
validation_1-logloss:0.16309
                                 validation 1-error:0.04048
[79]
        validation_0-logloss:0.14663
                                         validation 0-error:0.03451
validation_1-logloss:0.16275
                                 validation_1-error:0.04048
        validation_0-logloss:0.14567
                                         validation_0-error:0.03451
[80]
validation_1-logloss:0.16214
                                 validation_1-error:0.04048
        validation_0-logloss:0.14491
[81]
                                         validation_0-error:0.03451
validation_1-logloss:0.16196
                                 validation 1-error:0.04048
        validation_0-logloss:0.14448
[82]
                                         validation_0-error:0.03451
validation_1-logloss:0.16162
                                 validation_1-error:0.04048
[83]
        validation_0-logloss:0.14354
                                         validation_0-error:0.03376
validation_1-logloss:0.16127
                                 validation_1-error:0.04048
[84]
        validation_0-logloss:0.14288
                                         validation_0-error:0.03338
validation 1-logloss:0.16088
                                 validation 1-error:0.04048
        validation_0-logloss:0.14225
                                         validation 0-error:0.03338
validation 1-logloss:0.16119
                                 validation 1-error:0.04048
[86]
        validation_0-logloss:0.14138
                                         validation_0-error:0.03338
validation_1-logloss:0.16077
                                 validation 1-error:0.04048
[87]
        validation_0-logloss:0.14076
                                         validation_0-error:0.03338
validation_1-logloss:0.16064
                                 validation_1-error:0.04048
        validation_0-logloss:0.14011
                                         validation_0-error:0.03338
[88]
validation_1-logloss:0.16064
                                 validation_1-error:0.04048
[89]
        validation_0-logloss:0.13976
                                         validation_0-error:0.03338
validation_1-logloss:0.16045
                                 validation_1-error:0.04048
[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
        validation 0-logloss:0.13802
                                         validation 0-error:0.03301
validation 1-logloss:0.15969
                                 validation 1-error:0.04048
        validation 0-logloss:0.13750
                                         validation 0-error:0.03263
[93]
validation_1-logloss:0.15984
                                 validation 1-error:0.04048
        validation_0-logloss:0.13697
                                         validation_0-error:0.03263
[94]
validation_1-logloss:0.15963
                                 validation 1-error:0.04048
        validation_0-logloss:0.13667
                                         validation_0-error:0.03263
[95]
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
        validation_0-logloss:0.13609
[97]
                                         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
        validation 0-logloss:0.13475
                                         validation 0-error:0.03226
[101]
validation 1-logloss:0.15859
                                validation 1-error:0.04198
        validation 0-logloss:0.13447
                                         validation 0-error:0.03226
validation 1-logloss:0.15852
                                 validation 1-error:0.04348
        validation_0-logloss:0.13416
                                         validation 0-error:0.03188
[103]
validation_1-logloss:0.15854
                                validation_1-error:0.04348
        validation_0-logloss:0.13385
[104]
                                         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
        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
        validation_0-logloss:0.13208
[111]
                                         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
        validation 0-logloss:0.13135
[113]
                                         validation 0-error:0.03151
validation 1-logloss:0.15834
                                validation 1-error:0.04198
Γ1147
        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
        validation_0-logloss:0.13063
                                         validation_0-error:0.03151
[116]
validation_1-logloss:0.15842
                                validation_1-error:0.04048
        validation_0-logloss:0.13040
                                         validation_0-error:0.03151
[117]
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
        validation_0-logloss:0.65627
                                         validation_0-error:0.07014
[0]
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
        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
                                         validation_0-error:0.06639
        validation_0-logloss:0.53942
validation_1-logloss:0.54231
                                 validation_1-error:0.08246
        validation_0-logloss:0.51600
                                         validation_0-error:0.06639
[5]
validation_1-logloss:0.51928
                                 validation_1-error:0.08246
        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
        validation 0-logloss:0.43787
                                         validation 0-error:0.05439
validation 1-logloss:0.44190
                                 validation 1-error:0.05997
        validation 0-logloss:0.42171
                                         validation 0-error:0.05476
[10]
validation_1-logloss:0.42654
                                 validation_1-error:0.05997
        validation_0-logloss:0.40621
                                         validation_0-error:0.05401
[11]
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
        validation_0-logloss:0.37809
                                         validation_0-error:0.05364
[13]
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
        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
        validation 0-logloss:0.33193
[17]
                                         validation 0-error:0.04876
validation 1-logloss:0.33927
                                 validation 1-error:0.05547
Γ187
        validation_0-logloss:0.32201
                                         validation 0-error:0.04801
validation_1-logloss:0.32957
                                 validation_1-error:0.05397
        validation_0-logloss:0.31274
                                         validation 0-error:0.04614
Г197
validation_1-logloss:0.32093
                                 validation_1-error:0.05397
[20]
        validation_0-logloss:0.30398
                                         validation_0-error:0.04464
validation_1-logloss:0.31267
                                 validation_1-error:0.05097
        validation_0-logloss:0.29541
                                         validation_0-error:0.04426
[21]
validation_1-logloss:0.30441
                                 validation_1-error:0.05097
[22]
        validation_0-logloss:0.28743
                                         validation_0-error:0.04314
validation_1-logloss:0.29649
                                 validation_1-error:0.05097
[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
validation 1-logloss:0.27631
                                 validation 1-error:0.05247
        validation 0-logloss:0.25993
                                         validation 0-error:0.04389
[26]
validation 1-logloss:0.27061
                                 validation 1-error:0.05397
[27]
        validation_0-logloss:0.25396
                                         validation 0-error:0.04276
validation 1-logloss:0.26505
                                 validation 1-error:0.05397
                                         validation_0-error:0.04201
[28]
        validation_0-logloss:0.24857
validation_1-logloss:0.25969
                                 validation_1-error:0.05397
[29]
        validation_0-logloss:0.24283
                                         validation_0-error:0.04163
validation_1-logloss:0.25327
                                 validation_1-error:0.05097
        validation_0-logloss:0.23763
                                         validation_0-error:0.04126
[30]
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
validation 1-logloss:0.23633
                                 validation 1-error:0.05397
        validation 0-logloss:0.21969
                                         validation 0-error:0.04051
[34]
validation_1-logloss:0.23258
                                 validation_1-error:0.05397
        validation_0-logloss:0.21593
                                         validation_0-error:0.04013
[35]
validation_1-logloss:0.22920
                                 validation_1-error:0.05397
        validation_0-logloss:0.21217
                                         validation_0-error:0.04051
[36]
validation_1-logloss:0.22553
                                 validation_1-error:0.05697
        validation_0-logloss:0.20874
                                         validation_0-error:0.03864
[37]
validation_1-logloss:0.22231
                                 validation 1-error:0.05397
[38]
        validation_0-logloss:0.20537
                                         validation_0-error:0.03864
validation_1-logloss:0.21918
                                 validation_1-error:0.05397
[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
        validation 0-logloss:0.19613
[41]
                                         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
validation_1-logloss:0.20636
                                 validation_1-error:0.05247
        validation_0-logloss:0.19069
Γ431
                                         validation 0-error:0.03638
validation_1-logloss:0.20449
                                 validation_1-error:0.05097
        validation_0-logloss:0.18811
[44]
                                         validation_0-error:0.03601
validation_1-logloss:0.20250
                                 validation_1-error:0.05247
[45]
        validation_0-logloss:0.18547
                                         validation_0-error:0.03601
validation_1-logloss:0.19980
                                 validation_1-error:0.05547
[46]
        validation_0-logloss:0.18335
                                         validation_0-error:0.03488
validation_1-logloss:0.19775
                                 validation_1-error:0.05397
[47]
        validation_0-logloss:0.18118
                                         validation_0-error:0.03488
```

```
validation_1-logloss:0.19579
                                 validation_1-error:0.05247
[48]
        validation_0-logloss:0.17898
                                         validation_0-error:0.03526
validation_1-logloss:0.19333
                                 validation_1-error:0.04947
[49]
        validation_0-logloss:0.17688
                                         validation_0-error:0.03526
validation 1-logloss:0.19160
                                 validation 1-error:0.05097
[50]
        validation 0-logloss:0.17487
                                         validation 0-error:0.03526
validation 1-logloss:0.18951
                                 validation 1-error:0.05097
[51]
        validation_0-logloss:0.17306
                                         validation 0-error:0.03563
validation 1-logloss:0.18800
                                 validation 1-error:0.05097
                                         validation_0-error:0.03451
[52]
        validation_0-logloss:0.17104
validation_1-logloss:0.18554
                                 validation_1-error:0.04798
[53]
        validation_0-logloss:0.16942
                                         validation_0-error:0.03413
validation_1-logloss:0.18404
                                 validation_1-error:0.04798
        validation_0-logloss:0.16779
                                         validation_0-error:0.03413
[54]
validation_1-logloss:0.18239
                                 validation_1-error:0.04798
[55]
        validation_0-logloss:0.16645
                                         validation_0-error:0.03376
validation_1-logloss:0.18186
                                 validation_1-error:0.04947
[56]
        validation_0-logloss:0.16491
                                         validation_0-error:0.03376
validation_1-logloss:0.18057
                                 validation 1-error:0.04498
[57]
        validation 0-logloss:0.16321
                                         validation 0-error:0.03376
validation 1-logloss:0.17852
                                 validation 1-error:0.04498
        validation 0-logloss:0.16180
                                         validation 0-error:0.03376
[58]
validation_1-logloss:0.17744
                                 validation 1-error:0.04648
        validation_0-logloss:0.16032
                                         validation_0-error:0.03376
[59]
validation_1-logloss:0.17574
                                 validation_1-error:0.04648
        validation_0-logloss:0.15895
                                         validation_0-error:0.03376
[60]
validation_1-logloss:0.17399
                                 validation_1-error:0.04498
        validation_0-logloss:0.15772
[61]
                                         validation_0-error:0.03376
validation_1-logloss:0.17342
                                 validation 1-error:0.04498
[62]
        validation_0-logloss:0.15643
                                         validation_0-error:0.03226
validation_1-logloss:0.17188
                                 validation_1-error:0.04498
[63]
        validation_0-logloss:0.15523
                                         validation_0-error:0.03188
validation_1-logloss:0.17035
                                 validation_1-error:0.04498
[64]
        validation_0-logloss:0.15419
                                         validation_0-error:0.03226
validation 1-logloss:0.16979
                                 validation 1-error:0.04648
        validation 0-logloss:0.15305
[65]
                                         validation 0-error:0.03226
validation 1-logloss:0.16841
                                 validation_1-error:0.04348
[66]
        validation_0-logloss:0.15226
                                         validation 0-error:0.03226
validation_1-logloss:0.16788
                                 validation_1-error:0.04348
        validation_0-logloss:0.15124
[67]
                                         validation 0-error:0.03226
validation_1-logloss:0.16656
                                 validation_1-error:0.04198
        validation_0-logloss:0.15033
                                         validation_0-error:0.03226
[68]
validation_1-logloss:0.16606
                                 validation_1-error:0.04198
        validation_0-logloss:0.14932
                                         validation_0-error:0.03226
[69]
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
[71]
        validation_0-logloss:0.14763
                                         validation_0-error:0.03151
```

```
validation_1-logloss:0.16371
                                 validation_1-error:0.04348
[72]
        validation_0-logloss:0.14685
                                         validation_0-error:0.03113
validation_1-logloss:0.16268
                                 validation_1-error:0.04198
[73]
        validation_0-logloss:0.14626
                                         validation_0-error:0.03151
validation 1-logloss:0.16236
                                 validation 1-error:0.04198
[74]
        validation 0-logloss:0.14552
                                         validation 0-error:0.03151
validation 1-logloss:0.16145
                                 validation 1-error:0.04198
[75]
        validation_0-logloss:0.14470
                                         validation_0-error:0.03113
validation 1-logloss:0.16108
                                 validation 1-error:0.04198
                                         validation_0-error:0.03113
        validation_0-logloss:0.14403
[76]
validation_1-logloss:0.16037
                                 validation_1-error:0.04198
[77]
        validation_0-logloss:0.14319
                                         validation_0-error:0.03076
validation_1-logloss:0.15997
                                 validation_1-error:0.04198
        validation_0-logloss:0.14268
                                         validation_0-error:0.03038
[78]
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
[80]
        validation_0-logloss:0.14123
                                         validation_0-error:0.03001
validation_1-logloss:0.15881
                                 validation 1-error:0.04198
[81]
        validation 0-logloss:0.14061
                                         validation 0-error:0.03001
validation 1-logloss:0.15813
                                 validation 1-error:0.04198
        validation 0-logloss:0.14005
                                         validation 0-error:0.03001
[82]
validation_1-logloss:0.15798
                                 validation 1-error:0.04198
        validation_0-logloss:0.13940
                                         validation 0-error:0.03001
[83]
validation_1-logloss:0.15746
                                 validation_1-error:0.04048
[84]
        validation_0-logloss:0.13887
                                         validation_0-error:0.03001
validation_1-logloss:0.15674
                                 validation_1-error:0.04048
        validation_0-logloss:0.13836
                                         validation_0-error:0.02963
[85]
validation_1-logloss:0.15660
                                 validation 1-error:0.04048
[86]
        validation_0-logloss:0.13768
                                         validation_0-error:0.02963
validation_1-logloss:0.15623
                                 validation_1-error:0.04048
        validation_0-logloss:0.13726
[87]
                                         validation_0-error:0.02963
validation_1-logloss:0.15615
                                 validation_1-error:0.04048
[88]
        validation_0-logloss:0.13674
                                         validation_0-error:0.02963
validation 1-logloss:0.15606
                                 validation 1-error:0.04048
        validation 0-logloss:0.13623
[89]
                                         validation 0-error:0.02963
                                 validation_1-error:0.04048
validation 1-logloss:0.15543
[90]
        validation_0-logloss:0.13568
                                         validation 0-error:0.02963
validation_1-logloss:0.15529
                                 validation_1-error:0.04048
        validation_0-logloss:0.13524
                                         validation 0-error:0.02888
[91]
validation_1-logloss:0.15519
                                 validation_1-error:0.04048
        validation_0-logloss:0.13452
[92]
                                         validation_0-error:0.02926
validation_1-logloss:0.15469
                                 validation_1-error:0.04048
        validation_0-logloss:0.13422
                                         validation_0-error:0.02926
[93]
validation_1-logloss:0.15470
                                 validation_1-error:0.04048
[94]
        validation_0-logloss:0.13357
                                         validation_0-error:0.02888
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
        validation 0-logloss:0.13197
                                         validation 0-error:0.02851
[98]
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
        validation_0-logloss:0.13022
                                         validation_0-error:0.02776
[102]
validation_1-logloss:0.15312
                                 validation_1-error:0.03898
        validation_0-logloss:0.12979
                                         validation_0-error:0.02813
[103]
validation_1-logloss:0.15270
                                 validation_1-error:0.03898
[104]
        validation_0-logloss:0.12960
                                         validation_0-error:0.02813
validation 1-logloss:0.15281
                                 validation 1-error:0.03898
Γ105]
        validation 0-logloss:0.12919
                                         validation 0-error:0.02813
validation 1-logloss:0.15280
                                 validation 1-error:0.03898
        validation 0-logloss:0.12892
[106]
                                         validation 0-error:0.02813
validation_1-logloss:0.15282
                                 validation 1-error:0.03898
        validation_0-logloss:0.12858
                                         validation_0-error:0.02813
[107]
validation_1-logloss:0.15272
                                 validation_1-error:0.03898
        validation_0-logloss:0.12804
                                         validation_0-error:0.02776
[108]
validation_1-logloss:0.15249
                                 validation_1-error:0.03898
        validation_0-logloss:0.12767
[109]
                                         validation_0-error:0.02776
validation_1-logloss:0.15253
                                 validation 1-error:0.03898
[110]
        validation_0-logloss:0.12751
                                         validation_0-error:0.02776
validation_1-logloss:0.15259
                                 validation_1-error:0.03898
        validation_0-logloss:0.12727
[111]
                                         validation_0-error:0.02776
validation_1-logloss:0.15265
                                 validation_1-error:0.03898
                                         validation_0-error:0.02776
[112]
        validation_0-logloss:0.12689
validation 1-logloss:0.15215
                                 validation 1-error:0.03898
        validation 0-logloss:0.12653
[113]
                                         validation 0-error:0.02776
validation 1-logloss:0.15211
                                 validation 1-error:0.03898
Γ1147
        validation_0-logloss:0.12633
                                         validation 0-error:0.02776
validation_1-logloss:0.15213
                                 validation_1-error:0.03898
[115]
        validation_0-logloss:0.12610
                                         validation 0-error:0.02776
validation_1-logloss:0.15191
                                 validation_1-error:0.03898
        validation_0-logloss:0.12579
                                         validation_0-error:0.02776
[116]
validation_1-logloss:0.15191
                                 validation_1-error:0.03898
        validation_0-logloss:0.12548
                                         validation_0-error:0.02776
[117]
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)

validation_0-logloss:0.12511 validation 0-error:0.02776 Γ1187 validation_1-logloss:0.15194 validation_1-error:0.03898 validation_0-logloss:0.12479 validation 0-error:0.02776 [119] 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 validation_0-logloss:0.62239 validation_0-error:0.07127 validation_1-logloss:0.62482 validation_1-error:0.09145 validation_0-logloss:0.59182 [2] validation_0-error:0.07127 validation_1-logloss:0.59530 validation_1-error:0.08846 validation_0-logloss:0.56399 [3] 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 validation_0-logloss:0.51505 validation_0-error:0.07127 validation_1-logloss:0.52056 validation 1-error:0.08846 validation_0-logloss:0.49352 validation_0-error:0.07127 validation 1-logloss:0.50012 validation 1-error:0.08846 validation_0-logloss:0.47330 validation_0-error:0.07089 [7] validation 1-logloss:0.48052 validation 1-error:0.08846 validation_0-logloss:0.45494 validation_0-error:0.07089 validation_1-logloss:0.46318 validation_1-error:0.08846 [9] validation_0-logloss:0.43762 validation_0-error:0.07089 validation_1-logloss:0.44640 validation_1-error:0.08846 validation_0-logloss:0.42183 validation_0-error:0.07089 [10] validation_1-logloss:0.43162 validation_1-error:0.08846 validation_0-logloss:0.40661 validation_0-error:0.07089 [11] validation_1-logloss:0.41690 validation_1-error:0.09145 validation_0-logloss:0.39279 validation_0-error:0.07089 validation_1-logloss:0.40372 validation 1-error:0.09145 Γ137 validation_0-logloss:0.37958 validation_0-error:0.07052 validation_1-logloss:0.39076 validation_1-error:0.09145 validation_0-logloss:0.36749 validation 0-error:0.06977 Γ147 validation_1-logloss:0.37917 validation_1-error:0.09145 validation 0-logloss:0.35601 validation 0-error:0.05851 [15] validation_1-logloss:0.36811 validation_1-error:0.07196 [16] validation_0-logloss:0.34464 validation 0-error:0.05701 validation_1-logloss:0.35673 validation_1-error:0.07346 validation_0-logloss:0.33419 [17] validation_0-error:0.05701 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 validation_0-logloss:0.31505 [19] validation_0-error:0.05589

```
validation_1-logloss:0.32676
                                 validation_1-error:0.07346
[20]
        validation_0-logloss:0.30542
                                         validation_0-error:0.05439
validation_1-logloss:0.31766
                                 validation_1-error:0.07196
[21]
        validation_0-logloss:0.29653
                                         validation_0-error:0.05401
validation 1-logloss:0.30927
                                 validation 1-error:0.07046
[22]
        validation 0-logloss:0.28834
                                         validation 0-error:0.05401
validation 1-logloss:0.30129
                                 validation 1-error:0.07046
[23]
        validation_0-logloss:0.28067
                                         validation 0-error:0.05439
validation 1-logloss:0.29414
                                 validation 1-error:0.07046
[24]
        validation_0-logloss:0.27344
                                         validation_0-error:0.05251
validation_1-logloss:0.28699
                                 validation_1-error:0.07046
[25]
        validation_0-logloss:0.26659
                                         validation_0-error:0.05251
validation_1-logloss:0.28075
                                 validation_1-error:0.07046
        validation_0-logloss:0.26030
                                         validation_0-error:0.04951
[26]
validation_1-logloss:0.27468
                                 validation_1-error:0.06297
[27]
        validation_0-logloss:0.25450
                                         validation_0-error:0.04989
validation_1-logloss:0.26879
                                 validation_1-error:0.06297
[28]
        validation_0-logloss:0.24882
                                         validation_0-error:0.04876
validation_1-logloss:0.26368
                                 validation 1-error:0.06297
[29]
        validation 0-logloss:0.24354
                                         validation 0-error:0.04839
validation 1-logloss:0.25865
                                 validation 1-error:0.06147
        validation 0-logloss:0.23873
                                         validation 0-error:0.04464
[30]
validation_1-logloss:0.25447
                                 validation_1-error:0.06297
        validation_0-logloss:0.23403
                                         validation_0-error:0.04239
[31]
validation_1-logloss:0.25005
                                 validation_1-error:0.05997
[32]
        validation_0-logloss:0.22954
                                         validation_0-error:0.04163
validation_1-logloss:0.24580
                                 validation_1-error:0.06147
        validation_0-logloss:0.22554
[33]
                                         validation_0-error:0.04088
validation_1-logloss:0.24242
                                 validation 1-error:0.05997
[34]
        validation_0-logloss:0.22159
                                         validation_0-error:0.04051
validation_1-logloss:0.23898
                                 validation_1-error:0.05697
        validation_0-logloss:0.21776
[35]
                                         validation_0-error:0.04051
validation_1-logloss:0.23507
                                 validation_1-error:0.05697
[36]
        validation_0-logloss:0.21411
                                         validation_0-error:0.04051
validation 1-logloss:0.23179
                                 validation 1-error:0.05697
        validation 0-logloss:0.21084
[37]
                                         validation 0-error:0.04013
validation 1-logloss:0.22856
                                 validation_1-error:0.05697
[38]
        validation_0-logloss:0.20768
                                         validation 0-error:0.03976
validation_1-logloss:0.22561
                                 validation_1-error:0.05697
        validation_0-logloss:0.20461
                                         validation 0-error:0.04013
[39]
validation_1-logloss:0.22282
                                 validation_1-error:0.05547
        validation_0-logloss:0.20187
[40]
                                         validation_0-error:0.03939
validation_1-logloss:0.22050
                                 validation_1-error:0.05547
        validation_0-logloss:0.19913
                                         validation_0-error:0.03939
[41]
validation_1-logloss:0.21802
                                 validation_1-error:0.05547
[42]
        validation_0-logloss:0.19652
                                         validation_0-error:0.03939
validation_1-logloss:0.21586
                                 validation_1-error:0.05547
[43]
        validation_0-logloss:0.19407
                                         validation_0-error:0.04051
```

```
validation_1-logloss:0.21354
                                 validation_1-error:0.05397
[44]
        validation_0-logloss:0.19184
                                         validation_0-error:0.03939
validation_1-logloss:0.21123
                                 validation_1-error:0.05547
[45]
        validation_0-logloss:0.18973
                                         validation_0-error:0.03939
validation 1-logloss:0.20944
                                 validation 1-error:0.05547
        validation 0-logloss:0.18741
                                         validation 0-error:0.03976
[46]
validation 1-logloss:0.20742
                                 validation 1-error:0.05547
[47]
        validation_0-logloss:0.18535
                                         validation 0-error:0.03976
validation 1-logloss:0.20565
                                 validation 1-error:0.05397
                                         validation_0-error:0.03976
        validation_0-logloss:0.18309
[48]
validation_1-logloss:0.20416
                                 validation_1-error:0.05397
[49]
        validation_0-logloss:0.18136
                                         validation_0-error:0.03901
validation_1-logloss:0.20250
                                 validation_1-error:0.05397
        validation_0-logloss:0.17930
                                         validation_0-error:0.03939
[50]
validation_1-logloss:0.20093
                                 validation_1-error:0.05247
[51]
        validation_0-logloss:0.17721
                                         validation_0-error:0.03826
validation_1-logloss:0.19861
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17546
                                         validation_0-error:0.03864
validation_1-logloss:0.19699
                                 validation 1-error:0.05097
Γ531
        validation 0-logloss:0.17358
                                         validation 0-error:0.03864
validation 1-logloss:0.19459
                                 validation 1-error:0.05097
        validation 0-logloss:0.17196
                                         validation 0-error:0.03751
[54]
validation_1-logloss:0.19310
                                 validation 1-error:0.05097
        validation_0-logloss:0.17064
                                         validation_0-error:0.03751
[55]
validation_1-logloss:0.19164
                                 validation_1-error:0.05097
        validation_0-logloss:0.16921
                                         validation_0-error:0.03713
[56]
validation_1-logloss:0.19037
                                 validation_1-error:0.05097
        validation_0-logloss:0.16765
                                         validation_0-error:0.03713
[57]
validation_1-logloss:0.18860
                                 validation 1-error:0.05097
[58]
        validation_0-logloss:0.16621
                                         validation_0-error:0.03713
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
        validation_0-logloss:0.16480
[59]
                                         validation_0-error:0.03713
validation_1-logloss:0.18617
                                 validation_1-error:0.05097
[60]
        validation_0-logloss:0.16348
                                         validation_0-error:0.03676
validation 1-logloss:0.18509
                                 validation 1-error:0.05097
        validation 0-logloss:0.16223
[61]
                                         validation 0-error:0.03676
                                 validation_1-error:0.05097
validation 1-logloss:0.18418
[62]
        validation_0-logloss:0.16110
                                         validation 0-error:0.03638
validation_1-logloss:0.18267
                                 validation_1-error:0.05097
        validation_0-logloss:0.15998
                                         validation 0-error:0.03676
[63]
validation_1-logloss:0.18175
                                 validation_1-error:0.04947
        validation_0-logloss:0.15883
[64]
                                         validation_0-error:0.03601
validation_1-logloss:0.18082
                                 validation_1-error:0.04798
[65]
        validation_0-logloss:0.15795
                                         validation_0-error:0.03563
validation_1-logloss:0.18012
                                 validation_1-error:0.04798
[66]
        validation_0-logloss:0.15687
                                         validation_0-error:0.03601
validation_1-logloss:0.17883
                                 validation_1-error:0.04798
[67]
        validation_0-logloss:0.15609
                                         validation_0-error:0.03488
```

```
validation_1-logloss:0.17856
                                 validation_1-error:0.04798
[68]
        validation_0-logloss:0.15507
                                         validation_0-error:0.03488
validation_1-logloss:0.17725
                                 validation_1-error:0.04798
[69]
        validation_0-logloss:0.15429
                                         validation_0-error:0.03488
validation 1-logloss:0.17697
                                 validation 1-error:0.04798
[70]
        validation 0-logloss:0.15332
                                         validation 0-error:0.03526
validation 1-logloss:0.17599
                                 validation 1-error:0.04798
[71]
        validation_0-logloss:0.15267
                                         validation 0-error:0.03488
validation 1-logloss:0.17570
                                 validation 1-error:0.04798
        validation_0-logloss:0.15174
[72]
                                         validation_0-error:0.03451
validation_1-logloss:0.17435
                                 validation_1-error:0.04798
[73]
        validation_0-logloss:0.15083
                                         validation_0-error:0.03451
validation_1-logloss:0.17309
                                 validation_1-error:0.04798
        validation_0-logloss:0.15016
                                         validation_0-error:0.03451
[74]
validation_1-logloss:0.17284
                                 validation_1-error:0.04798
[75]
        validation_0-logloss:0.14928
                                         validation_0-error:0.03451
validation_1-logloss:0.17196
                                 validation_1-error:0.04798
[76]
        validation_0-logloss:0.14871
                                         validation_0-error:0.03413
validation_1-logloss:0.17204
                                 validation 1-error:0.04798
[77]
        validation 0-logloss:0.14795
                                         validation 0-error:0.03413
validation 1-logloss:0.17132
                                 validation 1-error:0.04947
        validation 0-logloss:0.14737
                                         validation 0-error:0.03413
[78]
validation_1-logloss:0.17114
                                 validation 1-error:0.04947
        validation_0-logloss:0.14669
                                         validation_0-error:0.03413
[79]
validation_1-logloss:0.17029
                                 validation_1-error:0.04798
        validation_0-logloss:0.14611
                                         validation_0-error:0.03413
[80]
validation_1-logloss:0.17022
                                 validation_1-error:0.04798
        validation_0-logloss:0.14574
[81]
                                         validation_0-error:0.03413
validation_1-logloss:0.17006
                                 validation 1-error:0.04798
[82]
        validation_0-logloss:0.14505
                                         validation_0-error:0.03413
validation_1-logloss:0.16938
                                 validation_1-error:0.04648
        validation_0-logloss:0.14425
[83]
                                         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
        validation 0-logloss:0.14320
[85]
                                         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
validation_1-logloss:0.16814
                                 validation_1-error:0.04648
        validation_0-logloss:0.14195
                                         validation 0-error:0.03413
[87]
validation_1-logloss:0.16773
                                 validation_1-error:0.04648
        validation_0-logloss:0.14165
                                         validation_0-error:0.03413
[88]
validation_1-logloss:0.16767
                                 validation_1-error:0.04648
        validation_0-logloss:0.14115
                                         validation_0-error:0.03376
[89]
validation_1-logloss:0.16780
                                 validation_1-error:0.04648
[90]
        validation_0-logloss:0.14085
                                         validation_0-error:0.03338
validation_1-logloss:0.16769
                                 validation_1-error:0.04648
[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)
        validation 0-logloss:0.13990
                                         validation 0-error:0.03301
[92]
validation_1-logloss:0.16690
                                validation_1-error:0.04648
        validation_0-logloss:0.13923
[93]
                                         validation_0-error:0.03301
validation_1-logloss:0.16657
                                validation_1-error:0.04648
        validation_0-logloss:0.13896
                                         validation_0-error:0.03301
[94]
validation_1-logloss:0.16646
                                validation_1-error:0.04648
[95]
        validation_0-logloss:0.13843
                                         validation_0-error:0.03301
validation_1-logloss:0.16599
                                validation_1-error:0.04648
[96]
        validation_0-logloss:0.13802
                                         validation_0-error:0.03301
validation_1-logloss:0.16592
                                validation_1-error:0.04648
        validation_0-logloss:0.13752
                                         validation_0-error:0.03301
[97]
validation 1-logloss:0.16546
                                validation 1-error:0.04648
        validation 0-logloss:0.13725
                                         validation 0-error:0.03301
validation 1-logloss:0.16527
                                validation 1-error:0.04648
[99]
        validation_0-logloss:0.13661
                                         validation_0-error:0.03301
validation_1-logloss:0.16496
                                validation_1-error:0.04648
[100]
        validation_0-logloss:0.13617
                                         validation_0-error:0.03301
validation_1-logloss:0.16442
                                validation_1-error:0.04648
        validation_0-logloss:0.13545
                                         validation_0-error:0.03301
[101]
validation_1-logloss:0.16417
                                validation_1-error:0.04648
        validation_0-logloss:0.13508
[102]
                                         validation 0-error:0.03301
validation_1-logloss:0.16357
                                validation_1-error:0.04648
        validation_0-logloss:0.13464
                                         validation_0-error:0.03301
[103]
validation_1-logloss:0.16366
                                validation_1-error:0.04648
[104]
        validation_0-logloss:0.13427
                                         validation_0-error:0.03301
validation 1-logloss:0.16362
                                validation 1-error:0.04648
        validation 0-logloss:0.13363
                                         validation_0-error:0.03301
[105]
validation 1-logloss:0.16349
                                validation 1-error:0.04648
        validation 0-logloss:0.13312
                                         validation 0-error:0.03263
validation_1-logloss:0.16332
                                validation_1-error:0.04648
        validation_0-logloss:0.13292
                                         validation_0-error:0.03263
[107]
validation_1-logloss:0.16336
                                validation 1-error:0.04648
        validation_0-logloss:0.13250
                                         validation_0-error:0.03301
[108]
validation_1-logloss:0.16356
                                validation_1-error:0.04648
[109]
        validation_0-logloss:0.13218
                                         validation_0-error:0.03301
```

validation 1-error:0.04648

validation_1-error:0.04648

validation_1-error:0.04648

validation_0-error:0.03301

validation_0-error:0.03263

validation_1-logloss:0.16303

validation_1-logloss:0.16300

validation_1-logloss:0.16320

validation_0-logloss:0.13176

validation_0-logloss:0.13132

[110]

[111]

```
[112]
        validation_0-logloss:0.13075
                                         validation_0-error:0.03263
validation_1-logloss:0.16312
                                 validation_1-error:0.04648
        validation_0-logloss:0.13032
                                         validation_0-error:0.03263
[113]
validation_1-logloss:0.16333
                                 validation 1-error:0.04648
        validation 0-logloss:0.12976
                                         validation 0-error:0.03263
Γ1147
validation 1-logloss:0.16281
                                 validation 1-error:0.04648
        validation 0-logloss:0.12917
                                         validation 0-error:0.03263
validation_1-logloss:0.16280
                                 validation 1-error:0.04648
        validation_0-logloss:0.12892
                                         validation 0-error:0.03263
[116]
validation_1-logloss:0.16290
                                 validation_1-error:0.04648
        validation_0-logloss:0.12854
                                         validation_0-error:0.03301
[117]
validation_1-logloss:0.16252
                                 validation_1-error:0.04648
        validation_0-logloss:0.12809
                                         validation_0-error:0.03263
[118]
validation_1-logloss:0.16224
                                 validation_1-error:0.04648
        validation_0-logloss:0.12780
[119]
                                         validation_0-error:0.03263
validation_1-logloss:0.16196
                                 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
        validation_0-logloss:0.59312
                                         validation 0-error:0.06977
validation 1-logloss:0.59544
                                 validation 1-error:0.08846
        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
validation_1-logloss:0.54368
                                 validation_1-error:0.06597
        validation_0-logloss:0.51683
                                         validation_0-error:0.06789
validation_1-logloss:0.52120
                                 validation_1-error:0.08546
        validation_0-logloss:0.49530
                                         validation 0-error:0.05664
validation_1-logloss:0.50006
                                 validation_1-error:0.06597
        validation_0-logloss:0.47549
                                         validation_0-error:0.05664
[7]
validation_1-logloss:0.48077
                                 validation_1-error:0.06597
[8]
        validation_0-logloss:0.45711
                                         validation_0-error:0.05664
validation_1-logloss:0.46288
                                 validation 1-error:0.06597
        validation 0-logloss:0.44010
                                         validation 0-error:0.05664
validation 1-logloss:0.44638
                                 validation 1-error:0.06597
        validation 0-logloss:0.42426
                                         validation 0-error:0.05626
validation_1-logloss:0.43083
                                 validation 1-error:0.06597
        validation_0-logloss:0.40960
                                         validation_0-error:0.05626
[11]
validation_1-logloss:0.41696
                                 validation 1-error:0.06597
        validation_0-logloss:0.39566
                                         validation_0-error:0.05626
[12]
validation_1-logloss:0.40292
                                 validation_1-error:0.06597
[13]
        validation_0-logloss:0.38262
                                         validation_0-error:0.05551
validation_1-logloss:0.39058
                                 validation 1-error:0.06597
        validation_0-logloss:0.36938
[14]
                                         validation_0-error:0.05551
validation_1-logloss:0.37747
                                 validation_1-error:0.06597
[15]
        validation_0-logloss:0.35702
                                         validation_0-error:0.05551
validation_1-logloss:0.36533
                                 validation_1-error:0.06597
```

```
Γ16]
        validation_0-logloss:0.34544
                                         validation_0-error:0.05551
validation_1-logloss:0.35374
                                 validation_1-error:0.06597
        validation_0-logloss:0.33464
                                         validation_0-error:0.05589
[17]
validation_1-logloss:0.34352
                                 validation 1-error:0.06747
        validation 0-logloss:0.32461
                                         validation 0-error:0.05551
Г187
validation 1-logloss:0.33363
                                 validation 1-error:0.06747
        validation 0-logloss:0.31518
                                         validation 0-error:0.05514
validation_1-logloss:0.32474
                                 validation 1-error:0.06897
[20]
        validation_0-logloss:0.30631
                                         validation 0-error:0.05514
validation_1-logloss:0.31585
                                 validation_1-error:0.06897
        validation_0-logloss:0.29760
                                         validation_0-error:0.05439
[21]
validation_1-logloss:0.30752
                                 validation_1-error:0.06597
        validation_0-logloss:0.28952
[22]
                                         validation_0-error:0.04839
validation_1-logloss:0.29954
                                 validation 1-error:0.06147
        validation_0-logloss:0.28192
[23]
                                         validation_0-error:0.04539
validation_1-logloss:0.29195
                                 validation_1-error:0.05847
[24]
        validation_0-logloss:0.27477
                                         validation_0-error:0.04539
validation_1-logloss:0.28516
                                 validation_1-error:0.05847
[25]
        validation 0-logloss:0.26789
                                         validation_0-error:0.04501
validation 1-logloss:0.27868
                                 validation 1-error:0.05697
        validation 0-logloss:0.26153
                                         validation 0-error:0.04389
validation 1-logloss:0.27269
                                 validation 1-error:0.05697
        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
        validation_0-logloss:0.24436
                                         validation_0-error:0.04426
[29]
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
validation 1-logloss:0.24230
                                 validation 1-error:0.05697
        validation 0-logloss:0.22560
                                         validation 0-error:0.04276
validation 1-logloss:0.23813
                                 validation 1-error:0.05697
        validation 0-logloss:0.22154
                                         validation 0-error:0.04201
[34]
validation_1-logloss:0.23434
                                 validation 1-error:0.05547
        validation_0-logloss:0.21749
                                         validation_0-error:0.04276
[35]
validation_1-logloss:0.23042
                                 validation 1-error:0.05547
        validation_0-logloss:0.21387
                                         validation_0-error:0.04201
[36]
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
        validation_0-logloss:0.20733
[38]
                                         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
        validation_0-logloss:0.19834
                                         validation_0-error:0.03939
[41]
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
        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
        validation_0-logloss:0.18830
                                         validation_0-error:0.03788
[45]
validation_1-logloss:0.20283
                                 validation_1-error:0.05247
        validation_0-logloss:0.18552
[46]
                                         validation_0-error:0.03826
validation_1-logloss:0.19944
                                 validation_1-error:0.04947
        validation_0-logloss:0.18350
[47]
                                         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
        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
validation_1-logloss:0.18963
                                 validation_1-error:0.05097
[52]
        validation_0-logloss:0.17353
                                         validation_0-error:0.03601
validation_1-logloss:0.18778
                                 validation_1-error:0.05097
        validation_0-logloss:0.17172
                                         validation_0-error:0.03638
[53]
validation_1-logloss:0.18606
                                 validation_1-error:0.05097
[54]
        validation_0-logloss:0.17038
                                         validation_0-error:0.03638
validation_1-logloss:0.18542
                                 validation_1-error:0.05097
[55]
        validation_0-logloss:0.16875
                                         validation_0-error:0.03638
validation_1-logloss:0.18403
                                 validation_1-error:0.05097
[56]
        validation_0-logloss:0.16720
                                         validation_0-error:0.03676
validation_1-logloss:0.18254
                                 validation 1-error:0.05097
        validation 0-logloss:0.16582
                                         validation 0-error:0.03676
validation 1-logloss:0.18126
                                 validation 1-error:0.05097
        validation 0-logloss:0.16482
                                         validation 0-error:0.03676
[58]
validation_1-logloss:0.18080
                                 validation 1-error:0.04947
[59]
        validation_0-logloss:0.16354
                                         validation_0-error:0.03676
validation_1-logloss:0.17999
                                 validation 1-error:0.04947
        validation_0-logloss:0.16225
                                         validation_0-error:0.03676
[60]
validation_1-logloss:0.17897
                                 validation_1-error:0.04947
[61]
        validation_0-logloss:0.16134
                                         validation_0-error:0.03713
validation_1-logloss:0.17849
                                 validation 1-error:0.04947
        validation_0-logloss:0.16050
[62]
                                         validation_0-error:0.03713
validation_1-logloss:0.17793
                                 validation_1-error:0.04947
[63]
        validation_0-logloss:0.15937
                                         validation_0-error:0.03676
validation_1-logloss:0.17710
                                 validation_1-error:0.04947
```

```
[64]
        validation_0-logloss:0.15855
                                         validation_0-error:0.03638
validation_1-logloss:0.17649
                                 validation_1-error:0.04947
        validation_0-logloss:0.15790
                                         validation_0-error:0.03601
[65]
validation_1-logloss:0.17627
                                 validation 1-error:0.04947
        validation 0-logloss:0.15723
                                         validation 0-error:0.03601
[66]
validation 1-logloss:0.17582
                                 validation 1-error:0.04947
        validation 0-logloss:0.15668
                                         validation 0-error:0.03601
validation_1-logloss:0.17589
                                 validation 1-error:0.04947
[68]
        validation_0-logloss:0.15559
                                         validation 0-error:0.03563
                                 validation_1-error:0.04947
validation_1-logloss:0.17503
        validation_0-logloss:0.15493
                                         validation_0-error:0.03563
[69]
validation_1-logloss:0.17435
                                 validation_1-error:0.04947
        validation_0-logloss:0.15425
                                         validation_0-error:0.03563
[70]
validation_1-logloss:0.17393
                                 validation 1-error:0.04798
        validation_0-logloss:0.15370
[71]
                                         validation_0-error:0.03563
validation_1-logloss:0.17341
                                 validation_1-error:0.04798
[72]
        validation_0-logloss:0.15274
                                         validation_0-error:0.03563
validation_1-logloss:0.17284
                                 validation_1-error:0.04798
[73]
        validation_0-logloss:0.15214
                                         validation_0-error:0.03563
validation 1-logloss:0.17253
                                 validation 1-error:0.04798
        validation_0-logloss:0.15161
                                         validation 0-error:0.03563
validation 1-logloss:0.17220
                                 validation 1-error:0.04798
[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
validation_1-logloss:0.17161
                                 validation_1-error:0.04798
[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-error:0.04648
validation_1-logloss:0.17077
[80]
        validation_0-logloss:0.14787
                                         validation_0-error:0.03451
validation 1-logloss:0.17088
                                 validation 1-error:0.04648
        validation 0-logloss:0.14705
                                         validation 0-error:0.03451
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
        validation_0-logloss:0.14564
                                         validation_0-error:0.03451
[83]
validation_1-logloss:0.16945
                                 validation 1-error:0.04648
        validation_0-logloss:0.14523
                                         validation_0-error:0.03451
[84]
validation_1-logloss:0.16924
                                 validation_1-error:0.04648
[85]
        validation_0-logloss:0.14453
                                         validation_0-error:0.03451
validation_1-logloss:0.16885
                                 validation 1-error:0.04648
        validation_0-logloss:0.14361
[86]
                                         validation_0-error:0.03451
validation_1-logloss:0.16779
                                 validation_1-error:0.04648
[87]
        validation_0-logloss:0.14338
                                         validation_0-error:0.03451
validation_1-logloss:0.16773
                                 validation_1-error:0.04648
```

```
[88]
        validation_0-logloss:0.14253
                                         validation_0-error:0.03413
validation_1-logloss:0.16684
                                 validation_1-error:0.04498
        validation_0-logloss:0.14228
[89]
                                         validation_0-error:0.03451
validation_1-logloss:0.16662
                                 validation 1-error:0.04498
        validation 0-logloss:0.14150
                                         validation 0-error:0.03376
[90]
validation 1-logloss:0.16615
                                 validation 1-error:0.04498
        validation 0-logloss:0.14131
                                         validation 0-error:0.03376
validation_1-logloss:0.16624
                                 validation 1-error:0.04498
[92]
        validation_0-logloss:0.14095
                                         validation 0-error:0.03376
validation_1-logloss:0.16615
                                 validation_1-error:0.04498
        validation_0-logloss:0.14016
                                         validation_0-error:0.03338
[93]
validation_1-logloss:0.16574
                                 validation_1-error:0.04498
        validation_0-logloss:0.13945
                                         validation_0-error:0.03263
[94]
validation_1-logloss:0.16531
                                 validation 1-error:0.04498
        validation_0-logloss:0.13931
[95]
                                         validation_0-error:0.03263
validation_1-logloss:0.16538
                                 validation_1-error:0.04498
[96]
        validation_0-logloss:0.13857
                                         validation_0-error:0.03226
validation_1-logloss:0.16513
                                 validation_1-error:0.04498
                                         validation_0-error:0.03263
[97]
        validation 0-logloss:0.13821
validation 1-logloss:0.16497
                                 validation 1-error:0.04498
                                         validation 0-error:0.03226
        validation 0-logloss:0.13791
validation 1-logloss:0.16498
                                 validation 1-error:0.04498
        validation_0-logloss:0.13760
                                         validation_0-error:0.03188
validation_1-logloss:0.16497
                                 validation_1-error:0.04498
[100]
        validation_0-logloss:0.13725
                                         validation_0-error:0.03226
validation_1-logloss:0.16508
                                 validation_1-error:0.04498
        validation_0-logloss:0.13690
                                         validation_0-error:0.03188
[101]
validation_1-logloss:0.16525
                                 validation_1-error:0.04498
[102]
        validation_0-logloss:0.13634
                                         validation_0-error:0.03188
validation_1-logloss:0.16515
                                 validation_1-error:0.04498
[103]
        validation_0-logloss:0.13622
                                         validation_0-error:0.03188
validation_1-logloss:0.16503
                                 validation_1-error:0.04498
[104]
        validation_0-logloss:0.13588
                                         validation_0-error:0.03188
validation 1-logloss:0.16516
                                 validation 1-error:0.04498
        validation 0-logloss:0.13554
                                         validation 0-error:0.03188
[105]
validation 1-logloss:0.16496
                                 validation 1-error:0.04498
        validation 0-logloss:0.13537
                                         validation 0-error:0.03188
[106]
validation_1-logloss:0.16492
                                 validation 1-error:0.04498
[107]
        validation_0-logloss:0.13503
                                         validation_0-error:0.03188
validation_1-logloss:0.16507
                                 validation 1-error:0.04498
        validation_0-logloss:0.13473
                                         validation_0-error:0.03188
[108]
validation_1-logloss:0.16518
                                 validation_1-error:0.04498
[109]
        validation_0-logloss:0.13442
                                         validation_0-error:0.03188
validation_1-logloss:0.16533
                                 validation 1-error:0.04498
        validation_0-logloss:0.13421
[110]
                                         validation_0-error:0.03151
validation_1-logloss:0.16554
                                 validation_1-error:0.04498
[111]
        validation_0-logloss:0.13393
                                         validation_0-error:0.03151
validation_1-logloss:0.16574
                                 validation_1-error:0.04498
```

```
[112]
        validation_0-logloss:0.13345
                                        validation_0-error:0.03151
validation_1-logloss:0.16543
                                validation_1-error:0.04498
[113]
        validation_0-logloss:0.13300
                                        validation_0-error:0.03151
validation_1-logloss:0.16503
                                validation 1-error:0.04348
        validation 0-logloss:0.13239
                                         validation 0-error:0.03188
Γ1147
validation 1-logloss:0.16506
                                validation 1-error:0.04498
        validation 0-logloss:0.13220
                                         validation 0-error:0.03188
validation_1-logloss:0.16487
                                 validation 1-error:0.04498
        validation_0-logloss:0.13205
                                         validation 0-error:0.03188
[116]
validation_1-logloss:0.16486
                                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)
[117]
        validation_0-logloss:0.13175
                                        validation_0-error:0.03188
validation_1-logloss:0.16490
                                validation 1-error:0.04498
Γ1187
        validation 0-logloss:0.13147
                                         validation 0-error:0.03188
validation 1-logloss:0.16500
                                validation 1-error:0.04498
        validation 0-logloss:0.13102
[119]
                                         validation 0-error:0.03188
validation_1-logloss:0.16502
                                validation_1-error:0.04348
        validation 0-logloss:0.65361
                                         validation_0-error:0.04801
validation_1-logloss:0.65491
                                validation_1-error:0.06447
        validation_0-logloss:0.61788
[1]
                                         validation_0-error:0.04726
validation_1-logloss:0.62047
                                validation_1-error:0.06147
        validation_0-logloss:0.58535
                                         validation_0-error:0.04914
validation_1-logloss:0.58902
                                validation 1-error:0.06447
        validation_0-logloss:0.55554
                                         validation_0-error:0.04726
validation_1-logloss:0.56018
                                validation_1-error:0.06147
        validation_0-logloss:0.52831
                                         validation_0-error:0.04726
validation_1-logloss:0.53382
                                validation_1-error:0.06147
        validation_0-logloss:0.50329
                                         validation_0-error:0.04764
[5]
validation 1-logloss:0.50931
                                validation 1-error:0.06297
        validation 0-logloss:0.48026
[6]
                                         validation 0-error:0.04876
validation 1-logloss:0.48664
                                validation 1-error:0.06447
        validation_0-logloss:0.45888
                                         validation 0-error:0.04764
[7]
validation_1-logloss:0.46626
                                validation_1-error:0.06297
[8]
        validation_0-logloss:0.43899
                                         validation 0-error:0.04726
validation_1-logloss:0.44708
                                validation_1-error:0.06147
        validation_0-logloss:0.42043
                                         validation_0-error:0.04726
[9]
validation_1-logloss:0.42892
                                validation_1-error:0.06147
        validation_0-logloss:0.40344
                                         validation_0-error:0.04726
[10]
validation_1-logloss:0.41277
                                validation_1-error:0.06147
        validation_0-logloss:0.38752
                                         validation_0-error:0.04726
validation_1-logloss:0.39711
                                validation_1-error:0.06147
[12]
        validation_0-logloss:0.37263
                                        validation_0-error:0.04689
```

```
validation_1-logloss:0.38235
                                 validation_1-error:0.06147
[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
validation 1-logloss:0.35692
                                 validation 1-error:0.06147
        validation 0-logloss:0.33409
                                         validation 0-error:0.04689
[15]
validation 1-logloss:0.34522
                                 validation 1-error:0.06147
Г16<sub>]</sub>
        validation_0-logloss:0.32290
                                         validation 0-error:0.04689
validation 1-logloss:0.33432
                                 validation 1-error:0.06147
                                         validation_0-error:0.04689
[17]
        validation_0-logloss:0.31134
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
        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
        validation 0-logloss:0.25586
                                         validation 0-error:0.04351
[23]
validation_1-logloss:0.26821
                                 validation_1-error:0.05247
        validation_0-logloss:0.24843
                                         validation_0-error:0.04239
[24]
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
        validation_0-logloss:0.23512
                                         validation_0-error:0.04201
[26]
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
        validation 0-logloss:0.21280
[30]
                                         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
validation_1-logloss:0.22326
                                 validation_1-error:0.04648
        validation_0-logloss:0.20386
[32]
                                         validation 0-error:0.03788
validation_1-logloss:0.21887
                                 validation_1-error:0.04648
        validation_0-logloss:0.19958
                                         validation_0-error:0.03788
[33]
validation_1-logloss:0.21502
                                 validation_1-error:0.04648
        validation_0-logloss:0.19528
                                         validation_0-error:0.03713
[34]
validation_1-logloss:0.21128
                                 validation_1-error:0.04348
[35]
        validation_0-logloss:0.19186
                                         validation_0-error:0.03713
validation_1-logloss:0.20786
                                 validation_1-error:0.04498
[36]
        validation_0-logloss:0.18798
                                         validation_0-error:0.03638
```

```
validation_1-logloss:0.20433
                                 validation_1-error:0.04648
[37]
        validation_0-logloss:0.18424
                                         validation_0-error:0.03263
validation_1-logloss:0.20097
                                 validation_1-error:0.04498
[38]
        validation_0-logloss:0.18135
                                         validation_0-error:0.03376
validation 1-logloss:0.19793
                                 validation 1-error:0.04348
[39]
        validation 0-logloss:0.17803
                                         validation 0-error:0.03301
                                 validation_1-error:0.04198
validation 1-logloss:0.19517
Γ401
        validation_0-logloss:0.17507
                                         validation_0-error:0.03151
validation 1-logloss:0.19259
                                 validation 1-error:0.04198
                                         validation_0-error:0.03076
[41]
        validation_0-logloss:0.17263
validation_1-logloss:0.19006
                                 validation_1-error:0.04048
[42]
        validation_0-logloss:0.16989
                                         validation_0-error:0.03076
validation_1-logloss:0.18773
                                 validation_1-error:0.04048
        validation_0-logloss:0.16775
                                         validation_0-error:0.03076
[43]
                                 validation_1-error:0.04048
validation_1-logloss:0.18565
[44]
        validation_0-logloss:0.16519
                                         validation_0-error:0.03076
validation_1-logloss:0.18362
                                 validation_1-error:0.03898
[45]
        validation_0-logloss:0.16323
                                         validation_0-error:0.03076
validation_1-logloss:0.18160
                                 validation 1-error:0.03898
Г461
        validation 0-logloss:0.16093
                                         validation 0-error:0.03076
validation 1-logloss:0.17970
                                 validation 1-error:0.03898
        validation 0-logloss:0.15896
                                         validation 0-error:0.03038
[47]
validation_1-logloss:0.17802
                                 validation_1-error:0.03898
        validation_0-logloss:0.15690
                                         validation_0-error:0.03038
[48]
validation_1-logloss:0.17671
                                 validation_1-error:0.03898
[49]
        validation_0-logloss:0.15492
                                         validation_0-error:0.03038
validation_1-logloss:0.17509
                                 validation_1-error:0.03898
        validation_0-logloss:0.65340
                                         validation_0-error:0.04839
[0]
validation_1-logloss:0.65419
                                 validation 1-error:0.05997
        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
        validation_0-logloss:0.55450
                                         validation_0-error:0.04801
[3]
validation 1-logloss:0.55758
                                 validation 1-error:0.05997
        validation 0-logloss:0.52703
[4]
                                         validation 0-error:0.04801
validation 1-logloss:0.53044
                                 validation 1-error:0.05997
        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
validation_1-logloss:0.48278
                                 validation_1-error:0.05247
        validation_0-logloss:0.45691
                                         validation_0-error:0.04539
[7]
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
        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
        validation_0-logloss:0.38586
[11]
                                         validation_0-error:0.04539
validation_1-logloss:0.39199
                                validation_1-error:0.04947
        validation_0-logloss:0.37106
                                         validation_0-error:0.04539
[12]
validation 1-logloss:0.37761
                                validation 1-error:0.04947
        validation 0-logloss:0.35735
                                         validation 0-error:0.04539
[13]
validation 1-logloss:0.36408
                                validation_1-error:0.04947
Γ14]
        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
        validation_0-logloss:0.31977
                                         validation_0-error:0.04464
[16]
validation_1-logloss:0.32678
                                validation_1-error:0.05097
        validation_0-logloss:0.30858
                                        validation_0-error:0.04464
[17]
validation_1-logloss:0.31574
                                validation_1-error:0.05247
        validation_0-logloss:0.29821
                                         validation_0-error:0.04426
[18]
validation_1-logloss:0.30545
                                validation_1-error:0.05247
        validation_0-logloss:0.28861
                                         validation_0-error:0.04351
[19]
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
        validation 0-logloss:0.27094
[21]
                                         validation 0-error:0.04539
validation_1-logloss:0.27829
                                validation_1-error:0.05547
        validation_0-logloss:0.26288
                                         validation_0-error:0.04389
[22]
validation_1-logloss:0.27059
                                validation_1-error:0.05397
        validation_0-logloss:0.25540
[23]
                                         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
        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)
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:0.22964
                                        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
        validation_0-logloss:0.21863
[29]
                                         validation_0-error:0.03788
validation_1-logloss:0.22776
                                 validation 1-error:0.04348
        validation 0-logloss:0.21363
                                         validation 0-error:0.03676
[30]
validation 1-logloss:0.22313
                                 validation 1-error:0.04348
        validation 0-logloss:0.20867
                                         validation 0-error:0.03713
validation_1-logloss:0.21884
                                 validation 1-error:0.04198
        validation_0-logloss:0.20403
                                         validation 0-error:0.03713
[32]
validation_1-logloss:0.21490
                                 validation_1-error:0.04198
        validation_0-logloss:0.19949
                                         validation_0-error:0.03788
[33]
validation_1-logloss:0.21128
                                 validation_1-error:0.04198
        validation_0-logloss:0.19518
[34]
                                         validation_0-error:0.03826
validation_1-logloss:0.20757
                                 validation 1-error:0.04198
        validation_0-logloss:0.19125
[35]
                                         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
                                         validation 0-error:0.03788
        validation_0-logloss:0.18063
validation 1-logloss:0.19563
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.17156
                                         validation_0-error:0.03676
[41]
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
        validation 0-logloss:0.16184
                                         validation 0-error:0.03676
validation 1-logloss:0.17977
                                 validation 1-error:0.04498
        validation 0-logloss:0.15995
                                         validation 0-error:0.03601
[46]
validation_1-logloss:0.17748
                                 validation 1-error:0.04498
        validation_0-logloss:0.15796
                                         validation_0-error:0.03563
[47]
validation_1-logloss:0.17555
                                 validation 1-error:0.04348
        validation_0-logloss:0.15607
                                         validation_0-error:0.03451
[48]
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
        validation_0-logloss:0.65361
[0]
                                         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
        validation_0-logloss:0.55559
                                         validation_0-error:0.05139
[3]
validation_1-logloss:0.55699
                                 validation 1-error:0.05547
        validation 0-logloss:0.52842
                                         validation 0-error:0.05251
[4]
validation 1-logloss:0.53003
                                 validation 1-error:0.05097
        validation 0-logloss:0.50329
                                         validation 0-error:0.05251
validation_1-logloss:0.50553
                                 validation 1-error:0.05097
        validation_0-logloss:0.48001
                                         validation 0-error:0.05176
                                 validation_1-error:0.05547
validation_1-logloss:0.48265
        validation_0-logloss:0.45867
                                         validation_0-error:0.05026
[7]
validation_1-logloss:0.46176
                                 validation_1-error:0.05697
        validation_0-logloss:0.43827
                                         validation_0-error:0.04689
validation_1-logloss:0.44185
                                 validation_1-error:0.05247
        validation_0-logloss:0.41971
[9]
                                         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
        validation_0-logloss:0.37042
                                         validation 0-error:0.04239
validation 1-logloss:0.37611
                                 validation 1-error:0.05697
        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
        validation_0-logloss:0.33004
                                         validation_0-error:0.03901
[15]
validation_1-logloss:0.33680
                                 validation_1-error:0.05547
        validation_0-logloss:0.31811
                                         validation_0-error:0.03901
[16]
validation_1-logloss:0.32498
                                 validation_1-error:0.05397
[17]
        validation_0-logloss:0.30705
                                         validation_0-error:0.03751
                                 validation_1-error:0.05247
validation_1-logloss:0.31423
        validation_0-logloss:0.29663
[18]
                                         validation_0-error:0.03713
validation_1-logloss:0.30448
                                 validation 1-error:0.05097
        validation 0-logloss:0.28675
                                         validation 0-error:0.03601
validation 1-logloss:0.29527
                                 validation 1-error:0.05247
        validation 0-logloss:0.27747
                                         validation 0-error:0.03526
[20]
validation_1-logloss:0.28615
                                 validation 1-error:0.04947
        validation_0-logloss:0.26873
                                         validation_0-error:0.03526
[21]
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
        validation_0-logloss:0.24592
[24]
                                         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
        validation_0-logloss:0.22700
[27]
                                         validation_0-error:0.03413
validation_1-logloss:0.23937
                                 validation 1-error:0.04348
        validation 0-logloss:0.22145
                                         validation 0-error:0.03376
Γ281
validation 1-logloss:0.23437
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.20637
                                         validation_0-error:0.03226
[31]
validation_1-logloss:0.22081
                                 validation_1-error:0.04348
        validation_0-logloss:0.20189
[32]
                                         validation_0-error:0.03113
validation_1-logloss:0.21689
                                 validation 1-error:0.04348
        validation_0-logloss:0.19778
[33]
                                         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
validation 1-logloss:0.20626
                                 validation 1-error:0.04348
        validation 0-logloss:0.18694
                                         validation 0-error:0.03038
validation 1-logloss:0.20312
                                 validation 1-error:0.04348
        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
        validation 0-logloss:0.16680
                                         validation 0-error:0.03001
validation 1-logloss:0.18574
                                 validation 1-error:0.04348
        validation 0-logloss:0.16458
                                         validation 0-error:0.02963
[44]
validation_1-logloss:0.18404
                                 validation 1-error:0.04498
        validation_0-logloss:0.16225
                                         validation_0-error:0.02926
[45]
validation_1-logloss:0.18184
                                 validation 1-error:0.04498
        validation_0-logloss:0.16033
                                         validation_0-error:0.02926
[46]
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
        validation_0-logloss:0.15629
[48]
                                         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
        validation_0-logloss:0.61719
                                         validation_0-error:0.04914
[1]
validation_1-logloss:0.61986
                                 validation 1-error:0.07046
        validation 0-logloss:0.58435
                                         validation 0-error:0.04914
[2]
validation 1-logloss:0.58815
                                 validation 1-error:0.07046
        validation 0-logloss:0.55429
                                         validation 0-error:0.04839
validation_1-logloss:0.55907
                                 validation 1-error:0.07196
        validation_0-logloss:0.52684
                                         validation 0-error:0.04839
validation_1-logloss:0.53237
                                 validation_1-error:0.07196
        validation_0-logloss:0.50165
                                         validation_0-error:0.04839
[5]
validation_1-logloss:0.50816
                                 validation_1-error:0.07196
        validation_0-logloss:0.47850
                                         validation_0-error:0.04764
validation_1-logloss:0.48549
                                 validation_1-error:0.07196
        validation_0-logloss:0.45709
[7]
                                         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
        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
        validation_0-logloss:0.35624
                                         validation_0-error:0.04689
[13]
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-error:0.06897
validation_1-logloss:0.34383
[16]
        validation_0-logloss:0.31977
                                         validation_0-error:0.04464
validation_1-logloss:0.33376
                                 validation 1-error:0.06897
        validation 0-logloss:0.30924
                                         validation 0-error:0.04389
validation 1-logloss:0.32373
                                 validation 1-error:0.06897
        validation 0-logloss:0.29882
                                         validation 0-error:0.04464
[18]
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
        validation_0-logloss:0.28000
                                         validation_0-error:0.04614
[20]
validation_1-logloss:0.29476
                                 validation_1-error:0.06447
[21]
        validation_0-logloss:0.27152
                                         validation_0-error:0.04651
                                 validation_1-error:0.06447
validation_1-logloss:0.28640
        validation_0-logloss:0.26336
[22]
                                         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
        validation_0-logloss:0.24179
                                        validation_0-error:0.04013
[25]
validation_1-logloss:0.25759
                                validation 1-error:0.05847
        validation 0-logloss:0.23549
                                         validation 0-error:0.04088
[26]
validation 1-logloss:0.25130
                                validation 1-error:0.05697
        validation 0-logloss:0.22962
                                         validation 0-error:0.04051
validation_1-logloss:0.24540
                                validation 1-error:0.05547
        validation_0-logloss:0.22400
                                         validation 0-error:0.04051
[28]
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)
        validation_0-logloss:0.21887
                                        validation 0-error:0.03976
[29]
validation_1-logloss:0.23467
                                validation_1-error:0.05397
        validation_0-logloss:0.21396
                                        validation_0-error:0.03976
[30]
validation_1-logloss:0.22988
                                validation_1-error:0.05247
        validation_0-logloss:0.20934
[31]
                                        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
        validation_0-logloss:0.20061
                                         validation_0-error:0.03751
validation_1-logloss:0.21710
                                validation_1-error:0.04947
        validation_0-logloss:0.19655
                                         validation_0-error:0.03713
[34]
validation 1-logloss:0.21312
                                validation 1-error:0.04798
        validation 0-logloss:0.19269
[35]
                                         validation 0-error:0.03713
validation 1-logloss:0.20947
                                validation 1-error:0.04798
        validation_0-logloss:0.18935
                                         validation 0-error:0.03676
[36]
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
        validation_0-logloss:0.18270
                                         validation_0-error:0.03601
[38]
validation_1-logloss:0.20053
                                validation_1-error:0.04648
        validation_0-logloss:0.17955
                                         validation_0-error:0.03526
[39]
validation_1-logloss:0.19787
                                validation_1-error:0.04798
        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
        validation_0-logloss:0.16636
                                         validation 0-error:0.03563
[44]
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
        validation_0-logloss:0.15734
                                         validation_0-error:0.03526
[48]
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-error:0.06747
validation 1-logloss:0.61976
        validation 0-logloss:0.58481
[2]
                                         validation 0-error:0.04876
validation_1-logloss:0.58796
                                 validation_1-error:0.06297
        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
        validation_0-logloss:0.50257
                                         validation_0-error:0.04764
validation_1-logloss:0.50833
                                 validation 1-error:0.06447
        validation_0-logloss:0.47952
                                         validation_0-error:0.04764
validation_1-logloss:0.48595
                                 validation_1-error:0.06297
        validation_0-logloss:0.45817
[7]
                                         validation_0-error:0.04689
validation_1-logloss:0.46544
                                 validation_1-error:0.06297
        validation_0-logloss:0.43836
                                         validation_0-error:0.04614
[8]
validation 1-logloss:0.44638
                                 validation 1-error:0.06447
        validation 0-logloss:0.42013
[9]
                                         validation 0-error:0.04539
validation 1-logloss:0.42895
                                 validation 1-error:0.06447
Γ107
        validation_0-logloss:0.40298
                                         validation 0-error:0.04539
validation_1-logloss:0.41250
                                 validation_1-error:0.06447
        validation_0-logloss:0.38723
[11]
                                         validation_0-error:0.04539
validation_1-logloss:0.39698
                                 validation_1-error:0.06447
[12]
        validation_0-logloss:0.37242
                                         validation_0-error:0.04501
validation_1-logloss:0.38215
                                 validation_1-error:0.06297
        validation_0-logloss:0.35861
                                         validation_0-error:0.04501
[13]
validation_1-logloss:0.36896
                                 validation_1-error:0.06297
        validation_0-logloss:0.34576
                                         validation_0-error:0.04576
validation_1-logloss:0.35613
                                 validation_1-error:0.06297
[15]
        validation_0-logloss:0.33358
                                         validation_0-error:0.04576
```

```
validation_1-logloss:0.34445
                                 validation_1-error:0.06297
        validation_0-logloss:0.32137
                                         validation_0-error:0.04576
[16]
validation_1-logloss:0.33266
                                 validation_1-error:0.06297
        validation_0-logloss:0.31016
                                         validation_0-error:0.04501
[17]
validation 1-logloss:0.32201
                                 validation 1-error:0.06297
        validation 0-logloss:0.29962
                                         validation 0-error:0.04351
[18]
validation 1-logloss:0.31167
                                 validation_1-error:0.06147
Г197
        validation_0-logloss:0.28978
                                         validation_0-error:0.04276
validation 1-logloss:0.30225
                                 validation 1-error:0.06147
[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
validation_1-logloss:0.28482
                                 validation_1-error:0.06147
        validation_0-logloss:0.26336
                                         validation_0-error:0.03976
[22]
validation_1-logloss:0.27677
                                 validation_1-error:0.05847
[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
Γ251
        validation 0-logloss:0.24151
                                         validation 0-error:0.03788
validation 1-logloss:0.25601
                                 validation 1-error:0.05247
        validation 0-logloss:0.23508
[26]
                                         validation 0-error:0.03751
validation_1-logloss:0.24927
                                 validation_1-error:0.05247
        validation 0-logloss:0.22920
                                         validation_0-error:0.03751
[27]
validation_1-logloss:0.24359
                                 validation_1-error:0.05247
        validation_0-logloss:0.22341
                                         validation_0-error:0.03751
[28]
validation_1-logloss:0.23809
                                 validation_1-error:0.05247
        validation_0-logloss:0.21801
[29]
                                         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
        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
        validation 0-logloss:0.19939
[33]
                                         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
        validation_0-logloss:0.18789
                                         validation_0-error:0.03526
[36]
validation_1-logloss:0.20633
                                 validation_1-error:0.04947
        validation_0-logloss:0.18432
                                         validation_0-error:0.03526
[37]
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
Γ431
        validation_0-logloss:0.16749
                                         validation_0-error:0.03413
validation 1-logloss:0.18880
                                 validation 1-error:0.04648
                                         validation_0-error:0.03338
        validation_0-logloss:0.16512
[44]
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
        validation_0-logloss:0.16080
                                         validation_0-error:0.03301
[46]
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
validation_1-logloss:0.17999
                                 validation 1-error:0.04648
[49]
        validation 0-logloss:0.15498
                                         validation 0-error:0.03301
validation 1-logloss:0.17784
                                 validation 1-error:0.04648
        validation 0-logloss:0.65361
                                         validation 0-error:0.04801
[0]
validation_1-logloss:0.65491
                                 validation_1-error:0.06447
        validation_0-logloss:0.61788
                                         validation_0-error:0.04726
[1]
validation_1-logloss:0.62047
                                 validation_1-error:0.06147
        validation_0-logloss:0.58535
                                         validation_0-error:0.04914
[2]
validation_1-logloss:0.58902
                                 validation_1-error:0.06447
        validation_0-logloss:0.55554
                                         validation_0-error:0.04726
[3]
validation_1-logloss:0.56018
                                 validation 1-error:0.06147
[4]
        validation_0-logloss:0.52831
                                         validation_0-error:0.04726
validation_1-logloss:0.53382
                                 validation_1-error:0.06147
        validation_0-logloss:0.50329
                                         validation_0-error:0.04764
validation_1-logloss:0.50931
                                 validation_1-error:0.06297
        validation_0-logloss:0.48026
                                         validation_0-error:0.04876
[6]
validation 1-logloss:0.48664
                                 validation 1-error:0.06447
        validation 0-logloss:0.45888
[7]
                                         validation 0-error:0.04764
validation 1-logloss:0.46626
                                 validation 1-error:0.06297
        validation_0-logloss:0.43899
                                         validation 0-error:0.04726
validation_1-logloss:0.44708
                                 validation_1-error:0.06147
        validation_0-logloss:0.42043
                                         validation 0-error:0.04726
[9]
validation_1-logloss:0.42892
                                 validation_1-error:0.06147
        validation_0-logloss:0.40344
[10]
                                         validation_0-error:0.04726
validation_1-logloss:0.41277
                                 validation_1-error:0.06147
        validation_0-logloss:0.38752
                                         validation_0-error:0.04726
[11]
validation_1-logloss:0.39711
                                 validation_1-error:0.06147
[12]
        validation_0-logloss:0.37263
                                         validation_0-error:0.04689
validation_1-logloss:0.38235
                                 validation_1-error:0.06147
[13]
        validation_0-logloss:0.35879
                                         validation_0-error:0.04689
```

```
validation_1-logloss:0.36900
                                validation_1-error:0.06147
        validation_0-logloss:0.34606
[14]
                                         validation_0-error:0.04689
validation_1-logloss:0.35692
                                validation_1-error:0.06147
        validation_0-logloss:0.33409
                                         validation 0-error:0.04689
[15]
validation 1-logloss:0.34522
                                validation 1-error:0.06147
        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
        validation_0-logloss:0.29063
[19]
                                         validation_0-error:0.04651
validation_1-logloss:0.30210
                                validation_1-error:0.06147
        validation_0-logloss:0.28130
                                        validation_0-error:0.04501
[20]
validation_1-logloss:0.29290
                                validation_1-error:0.05397
        validation_0-logloss:0.27240
                                         validation_0-error:0.04426
[21]
validation_1-logloss:0.28427
                                validation_1-error:0.05247
        validation_0-logloss:0.26386
                                        validation_0-error:0.04389
[22]
validation_1-logloss:0.27605
                                validation 1-error:0.05247
Γ231
        validation 0-logloss:0.25586
                                         validation 0-error:0.04351
                                validation 1-error:0.05247
validation 1-logloss:0.26821
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)
        validation_0-logloss:0.24843
                                        validation 0-error:0.04239
[24]
validation 1-logloss:0.26122
                                validation 1-error:0.04947
        validation 0-logloss:0.24170
                                         validation 0-error:0.04163
validation_1-logloss:0.25455
                                validation 1-error:0.04947
        validation_0-logloss:0.23512
                                         validation_0-error:0.04201
[26]
validation_1-logloss:0.24846
                                validation_1-error:0.04947
        validation_0-logloss:0.22898
                                         validation_0-error:0.04201
[27]
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
validation_1-logloss:0.22326
                                 validation_1-error:0.04648
        validation_0-logloss:0.20386
[32]
                                         validation_0-error:0.03788
validation_1-logloss:0.21887
                                 validation 1-error:0.04648
        validation 0-logloss:0.19958
                                         validation 0-error:0.03788
[33]
validation 1-logloss:0.21502
                                 validation 1-error:0.04648
        validation 0-logloss:0.19528
                                         validation 0-error:0.03713
validation_1-logloss:0.21128
                                 validation 1-error:0.04348
        validation_0-logloss:0.19186
                                         validation 0-error:0.03713
[35]
validation_1-logloss:0.20786
                                 validation_1-error:0.04498
        validation_0-logloss:0.18798
                                         validation_0-error:0.03638
[36]
validation_1-logloss:0.20433
                                 validation_1-error:0.04648
        validation_0-logloss:0.18424
[37]
                                         validation_0-error:0.03263
validation_1-logloss:0.20097
                                 validation_1-error:0.04498
        validation_0-logloss:0.18135
[38]
                                         validation_0-error:0.03376
validation_1-logloss:0.19793
                                 validation_1-error:0.04348
[39]
        validation_0-logloss:0.17803
                                         validation_0-error:0.03301
validation_1-logloss:0.19517
                                 validation_1-error:0.04198
[40]
        validation_0-logloss:0.17507
                                         validation_0-error:0.03151
validation 1-logloss:0.19259
                                 validation 1-error:0.04198
        validation_0-logloss:0.17263
                                         validation 0-error:0.03076
validation 1-logloss:0.19006
                                 validation 1-error:0.04048
[42]
        validation_0-logloss:0.16989
                                         validation_0-error:0.03076
validation_1-logloss:0.18773
                                 validation_1-error:0.04048
[43]
        validation_0-logloss:0.16775
                                         validation_0-error:0.03076
validation_1-logloss:0.18565
                                 validation_1-error:0.04048
        validation_0-logloss:0.16519
                                         validation_0-error:0.03076
[44]
validation_1-logloss:0.18362
                                 validation_1-error:0.03898
[45]
        validation_0-logloss:0.16323
                                         validation 0-error:0.03076
validation_1-logloss:0.18160
                                 validation_1-error:0.03898
[46]
        validation_0-logloss:0.16093
                                         validation_0-error:0.03076
validation_1-logloss:0.17970
                                 validation_1-error:0.03898
[47]
        validation_0-logloss:0.15896
                                         validation_0-error:0.03038
validation_1-logloss:0.17802
                                 validation 1-error:0.03898
        validation 0-logloss:0.15690
                                         validation 0-error:0.03038
validation 1-logloss:0.17671
                                 validation 1-error:0.03898
        validation 0-logloss:0.15492
                                         validation 0-error:0.03038
[49]
validation_1-logloss:0.17509
                                 validation 1-error:0.03898
[50]
        validation_0-logloss:0.15305
                                         validation_0-error:0.03038
validation_1-logloss:0.17344
                                 validation 1-error:0.03898
        validation_0-logloss:0.15136
                                         validation_0-error:0.03001
[51]
validation_1-logloss:0.17157
                                 validation_1-error:0.03898
[52]
        validation_0-logloss:0.14953
                                         validation_0-error:0.02963
validation_1-logloss:0.17035
                                 validation 1-error:0.03898
        validation_0-logloss:0.14800
[53]
                                         validation_0-error:0.02963
validation_1-logloss:0.16894
                                 validation_1-error:0.03898
[54]
        validation_0-logloss:0.14653
                                         validation_0-error:0.02963
validation_1-logloss:0.16751
                                 validation_1-error:0.03898
```

```
[55]
        validation_0-logloss:0.14516
                                         validation_0-error:0.02963
validation_1-logloss:0.16618
                                 validation_1-error:0.03898
        validation_0-logloss:0.14380
[56]
                                         validation_0-error:0.02963
validation_1-logloss:0.16481
                                 validation 1-error:0.04048
        validation 0-logloss:0.14230
                                         validation 0-error:0.02926
[57]
validation 1-logloss:0.16406
                                 validation 1-error:0.03898
        validation 0-logloss:0.14106
                                         validation 0-error:0.02888
validation_1-logloss:0.16286
                                 validation 1-error:0.03898
[59]
        validation_0-logloss:0.13968
                                         validation 0-error:0.02851
validation_1-logloss:0.16215
                                 validation_1-error:0.03898
        validation_0-logloss:0.13853
                                         validation_0-error:0.02851
[60]
validation_1-logloss:0.16127
                                 validation_1-error:0.03898
        validation_0-logloss:0.13748
                                         validation_0-error:0.02851
[61]
validation_1-logloss:0.16041
                                 validation_1-error:0.03898
        validation_0-logloss:0.13621
[62]
                                         validation_0-error:0.02888
validation_1-logloss:0.15919
                                 validation_1-error:0.03898
[63]
        validation_0-logloss:0.13456
                                         validation_0-error:0.02813
validation_1-logloss:0.15885
                                 validation_1-error:0.03898
[64]
        validation_0-logloss:0.13340
                                         validation_0-error:0.02851
validation 1-logloss:0.15780
                                 validation 1-error:0.03898
        validation_0-logloss:0.13195
                                         validation 0-error:0.02813
validation 1-logloss:0.15733
                                 validation 1-error:0.03898
        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
        validation_0-logloss:0.12838
                                         validation_0-error:0.02888
[68]
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-error:0.03898
validation_1-logloss:0.15395
[71]
        validation_0-logloss:0.12513
                                         validation_0-error:0.02851
validation_1-logloss:0.15309
                                 validation 1-error:0.03898
        validation 0-logloss:0.12425
                                         validation 0-error:0.02851
validation 1-logloss:0.15282
                                 validation 1-error:0.03898
        validation 0-logloss:0.12365
                                         validation 0-error:0.02851
[73]
validation_1-logloss:0.15227
                                 validation 1-error:0.03898
        validation_0-logloss:0.12291
                                         validation_0-error:0.02813
[74]
validation_1-logloss:0.15238
                                 validation 1-error:0.03898
        validation_0-logloss:0.65340
                                         validation_0-error:0.04839
[0]
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
        validation_0-logloss:0.58454
[2]
                                         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
        validation_0-logloss:0.50170
                                         validation_0-error:0.04501
[5]
validation_1-logloss:0.50581
                                 validation 1-error:0.05397
        validation 0-logloss:0.47838
                                         validation 0-error:0.04501
[6]
validation 1-logloss:0.48278
                                 validation 1-error:0.05247
        validation 0-logloss:0.45691
                                         validation 0-error:0.04539
validation_1-logloss:0.46171
                                 validation 1-error:0.04947
        validation_0-logloss:0.43717
                                         validation 0-error:0.04501
                                 validation_1-error:0.05097
validation_1-logloss:0.44212
        validation_0-logloss:0.41881
                                         validation_0-error:0.04501
[9]
validation_1-logloss:0.42422
                                 validation_1-error:0.04947
        validation_0-logloss:0.40164
                                         validation_0-error:0.04539
[10]
validation_1-logloss:0.40748
                                 validation 1-error:0.04947
        validation_0-logloss:0.38586
[11]
                                         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
        validation_0-logloss:0.34431
                                         validation 0-error:0.04539
validation 1-logloss:0.35132
                                 validation 1-error:0.04947
        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
        validation_0-logloss:0.30858
                                         validation_0-error:0.04464
[17]
validation_1-logloss:0.31574
                                 validation_1-error:0.05247
        validation_0-logloss:0.29821
[18]
                                         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-error:0.05397
validation_1-logloss:0.29585
        validation_0-logloss:0.27953
[20]
                                         validation_0-error:0.04389
validation 1-logloss:0.28692
                                 validation 1-error:0.05397
        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
        validation_0-logloss:0.24837
                                         validation_0-error:0.04239
[24]
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
        validation_0-logloss:0.23556
[26]
                                         validation_0-error:0.03976
validation_1-logloss:0.24374
                                 validation_1-error:0.04798
[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
        validation_0-logloss:0.21863
                                         validation_0-error:0.03788
[29]
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
        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
        validation_0-logloss:0.19949
                                         validation_0-error:0.03788
[33]
validation_1-logloss:0.21128
                                 validation_1-error:0.04198
        validation_0-logloss:0.19518
                                         validation_0-error:0.03826
[34]
validation_1-logloss:0.20757
                                 validation 1-error:0.04198
        validation_0-logloss:0.19125
[35]
                                         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
        validation 0-logloss:0.18063
                                         validation 0-error:0.03788
validation 1-logloss:0.19563
                                 validation 1-error:0.04348
        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
        validation_0-logloss:0.17156
                                         validation_0-error:0.03676
[41]
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
        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
        validation_0-logloss:0.15796
                                         validation_0-error:0.03563
[47]
validation_1-logloss:0.17555
                                 validation 1-error:0.04348
        validation_0-logloss:0.15607
                                         validation_0-error:0.03451
[48]
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
        validation_0-logloss:0.15281
[50]
                                         validation_0-error:0.03376
validation_1-logloss:0.17037
                                 validation_1-error:0.04348
[51]
        validation_0-logloss:0.15095
                                         validation_0-error:0.03226
validation_1-logloss:0.16928
                                 validation_1-error:0.04348
```

```
[52]
        validation_0-logloss:0.14942
                                         validation_0-error:0.03338
validation_1-logloss:0.16785
                                 validation_1-error:0.04198
        validation_0-logloss:0.14813
                                         validation_0-error:0.03301
[53]
validation_1-logloss:0.16629
                                 validation 1-error:0.04048
        validation 0-logloss:0.14681
                                         validation 0-error:0.03338
Γ541
validation 1-logloss:0.16487
                                 validation 1-error:0.04048
        validation 0-logloss:0.14518
                                         validation 0-error:0.03338
validation_1-logloss:0.16381
                                 validation 1-error:0.04048
[56]
        validation_0-logloss:0.14407
                                         validation 0-error:0.03301
validation_1-logloss:0.16247
                                 validation_1-error:0.04048
        validation_0-logloss:0.14303
                                         validation_0-error:0.03263
[57]
validation_1-logloss:0.16165
                                 validation_1-error:0.03898
        validation_0-logloss:0.14164
                                         validation_0-error:0.03301
[58]
validation_1-logloss:0.16081
                                 validation 1-error:0.03898
        validation_0-logloss:0.14080
[59]
                                         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
validation_1-logloss:0.15913
                                 validation_1-error:0.04048
[61]
        validation_0-logloss:0.13833
                                         validation_0-error:0.03226
validation 1-logloss:0.15808
                                 validation 1-error:0.04048
        validation 0-logloss:0.13693
                                         validation 0-error:0.03188
validation 1-logloss:0.15721
                                 validation 1-error:0.04048
        validation_0-logloss:0.13589
                                         validation_0-error:0.03188
validation_1-logloss:0.15661
                                 validation 1-error:0.04048
[64]
        validation_0-logloss:0.13489
                                         validation_0-error:0.03188
validation_1-logloss:0.15564
                                 validation_1-error:0.04048
        validation_0-logloss:0.13401
                                         validation_0-error:0.03226
[65]
validation_1-logloss:0.15494
                                 validation_1-error:0.04048
[66]
        validation_0-logloss:0.13320
                                         validation_0-error:0.03226
validation_1-logloss:0.15462
                                 validation_1-error:0.04048
[67]
        validation_0-logloss:0.13250
                                         validation_0-error:0.03188
validation_1-logloss:0.15375
                                 validation_1-error:0.03898
[68]
        validation_0-logloss:0.13161
                                         validation_0-error:0.03226
validation 1-logloss:0.15315
                                 validation 1-error:0.04048
        validation 0-logloss:0.13085
                                         validation 0-error:0.03188
validation 1-logloss:0.15258
                                 validation 1-error:0.04048
        validation 0-logloss:0.12960
                                         validation 0-error:0.03113
[70]
validation_1-logloss:0.15211
                                 validation 1-error:0.04048
        validation_0-logloss:0.12889
                                         validation_0-error:0.03076
[71]
validation_1-logloss:0.15161
                                 validation 1-error:0.04048
[72]
        validation_0-logloss:0.12831
                                         validation_0-error:0.03076
validation_1-logloss:0.15144
                                 validation_1-error:0.04048
[73]
        validation_0-logloss:0.12780
                                         validation_0-error:0.03151
validation_1-logloss:0.15124
                                 validation 1-error:0.04048
        validation_0-logloss:0.12698
[74]
                                         validation_0-error:0.03038
validation_1-logloss:0.15079
                                 validation_1-error:0.04048
[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
        validation_0-logloss:0.58546
                                        validation_0-error:0.05214
[2]
validation_1-logloss:0.58611
                                validation 1-error:0.05247
        validation 0-logloss:0.55559
                                         validation 0-error:0.05139
[3]
validation 1-logloss:0.55699
                                validation 1-error:0.05547
        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)
                                        validation 0-error:0.05251
[5]
        validation 0-logloss:0.50329
validation_1-logloss:0.50553
                                validation 1-error:0.05097
        validation_0-logloss:0.48001
                                         validation 0-error:0.05176
validation_1-logloss:0.48265
                                validation_1-error:0.05547
        validation_0-logloss:0.45867
[7]
                                         validation_0-error:0.05026
validation_1-logloss:0.46176
                                validation_1-error:0.05697
        validation_0-logloss:0.43827
                                        validation_0-error:0.04689
validation_1-logloss:0.44185
                                validation 1-error:0.05247
        validation_0-logloss:0.41971
                                         validation_0-error:0.04614
validation_1-logloss:0.42423
                                validation_1-error:0.05397
        validation_0-logloss:0.40215
                                         validation_0-error:0.04651
validation_1-logloss:0.40692
                                validation_1-error:0.05397
        validation_0-logloss:0.38587
                                         validation_0-error:0.04314
[11]
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
        validation_0-logloss:0.35640
                                         validation_0-error:0.04201
Γ13]
validation_1-logloss:0.36233
                                validation_1-error:0.05547
Γ14]
        validation_0-logloss:0.34279
                                         validation_0-error:0.04163
validation_1-logloss:0.34910
                                validation_1-error:0.05697
        validation_0-logloss:0.33004
                                         validation_0-error:0.03901
[15]
validation_1-logloss:0.33680
                                validation_1-error:0.05547
        validation_0-logloss:0.31811
                                         validation_0-error:0.03901
validation_1-logloss:0.32498
                                validation_1-error:0.05397
        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
        validation_0-logloss:0.23911
                                         validation_0-error:0.03488
[25]
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
Γ281
        validation 0-logloss:0.22145
                                         validation 0-error:0.03376
validation 1-logloss:0.23437
                                 validation 1-error:0.04348
        validation 0-logloss:0.21623
                                         validation 0-error:0.03301
[29]
validation_1-logloss:0.22965
                                 validation 1-error:0.04348
        validation_0-logloss:0.21115
                                         validation_0-error:0.03226
[30]
validation_1-logloss:0.22507
                                 validation_1-error:0.04348
        validation_0-logloss:0.20637
                                         validation_0-error:0.03226
[31]
validation_1-logloss:0.22081
                                 validation_1-error:0.04348
        validation_0-logloss:0.20189
[32]
                                         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
        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
validation 1-logloss:0.20626
                                 validation 1-error:0.04348
        validation 0-logloss:0.18694
[36]
                                         validation 0-error:0.03038
validation 1-logloss:0.20312
                                 validation_1-error:0.04348
[37]
        validation_0-logloss:0.18370
                                         validation 0-error:0.03113
validation_1-logloss:0.20022
                                 validation_1-error:0.04348
        validation_0-logloss:0.18042
                                         validation 0-error:0.03113
[38]
validation_1-logloss:0.19740
                                 validation_1-error:0.04498
        validation_0-logloss:0.17786
[39]
                                         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
        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
Г461
        validation_0-logloss:0.16033
                                         validation 0-error:0.02926
validation 1-logloss:0.18061
                                 validation 1-error:0.04498
                                         validation_0-error:0.02888
        validation_0-logloss:0.15815
[47]
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
        validation_0-logloss:0.15450
                                         validation_0-error:0.02851
[49]
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
Γ521
        validation 0-logloss:0.14950
                                         validation 0-error:0.02813
validation 1-logloss:0.17090
                                 validation 1-error:0.04348
        validation 0-logloss:0.14782
                                         validation 0-error:0.02813
[53]
validation_1-logloss:0.16998
                                 validation 1-error:0.04348
        validation_0-logloss:0.14632
                                         validation 0-error:0.02776
[54]
validation_1-logloss:0.16856
                                 validation_1-error:0.04348
        validation_0-logloss:0.14482
                                         validation_0-error:0.02776
[55]
validation_1-logloss:0.16761
                                 validation_1-error:0.04348
        validation_0-logloss:0.14355
                                         validation_0-error:0.02776
[56]
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
        validation_0-logloss:0.14094
[58]
                                         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
        validation 0-logloss:0.13851
[60]
                                         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
        validation_0-logloss:0.13575
                                         validation 0-error:0.02701
[62]
validation_1-logloss:0.16074
                                 validation_1-error:0.04048
        validation_0-logloss:0.13429
[63]
                                         validation_0-error:0.02701
validation_1-logloss:0.16013
                                 validation_1-error:0.04048
        validation_0-logloss:0.13281
                                         validation_0-error:0.02701
[64]
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
        validation_0-logloss:0.12575
[70]
                                         validation_0-error:0.02701
validation 1-logloss:0.15627
                                 validation 1-error:0.04048
                                         validation_0-error:0.02663
        validation_0-logloss:0.12495
[71]
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
        validation_0-logloss:0.12350
                                         validation_0-error:0.02701
[73]
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
[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
        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
        validation_0-logloss:0.50165
                                         validation_0-error:0.04839
validation_1-logloss:0.50816
                                 validation 1-error:0.07196
        validation_0-logloss:0.47850
                                         validation_0-error:0.04764
validation_1-logloss:0.48549
                                 validation_1-error:0.07196
        validation_0-logloss:0.45709
[7]
                                         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
        validation 0-logloss:0.41837
[9]
                                         validation 0-error:0.04726
validation 1-logloss:0.42711
                                 validation 1-error:0.07196
Γ107
        validation_0-logloss:0.40110
                                         validation 0-error:0.04726
validation_1-logloss:0.41061
                                 validation_1-error:0.07196
        validation_0-logloss:0.38526
                                         validation 0-error:0.04726
[11]
validation_1-logloss:0.39515
                                 validation_1-error:0.07046
        validation_0-logloss:0.37023
[12]
                                         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
        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
        validation_0-logloss:0.30924
[17]
                                         validation 0-error:0.04389
validation 1-logloss:0.32373
                                 validation 1-error:0.06897
        validation 0-logloss:0.29882
                                         validation 0-error:0.04464
[18]
validation 1-logloss:0.31355
                                 validation 1-error:0.06597
Г197
        validation_0-logloss:0.28907
                                         validation 0-error:0.04501
validation 1-logloss:0.30398
                                 validation 1-error:0.06447
                                         validation_0-error:0.04614
[20]
        validation_0-logloss:0.28000
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
        validation_0-logloss:0.26336
                                         validation_0-error:0.04314
[22]
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
Γ251
        validation 0-logloss:0.24179
                                         validation 0-error:0.04013
validation 1-logloss:0.25759
                                 validation 1-error:0.05847
        validation 0-logloss:0.23549
                                         validation 0-error:0.04088
[26]
validation_1-logloss:0.25130
                                 validation 1-error:0.05697
        validation_0-logloss:0.22962
                                         validation_0-error:0.04051
[27]
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
        validation_0-logloss:0.21887
                                         validation_0-error:0.03976
[29]
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
        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
        validation 0-logloss:0.20061
[33]
                                         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
        validation_0-logloss:0.19269
                                         validation 0-error:0.03713
[35]
validation_1-logloss:0.20947
                                 validation_1-error:0.04798
        validation_0-logloss:0.18935
                                         validation_0-error:0.03676
[36]
validation_1-logloss:0.20619
                                 validation_1-error:0.04648
        validation_0-logloss:0.18605
                                         validation_0-error:0.03638
[37]
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
Γ431
        validation_0-logloss:0.16875
                                         validation_0-error:0.03563
validation 1-logloss:0.18994
                                 validation 1-error:0.04798
                                         validation_0-error:0.03563
[44]
        validation_0-logloss:0.16636
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
        validation_0-logloss:0.16179
                                         validation_0-error:0.03526
[46]
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
        validation 0-logloss:0.15390
                                         validation 0-error:0.03451
[50]
validation_1-logloss:0.18105
                                 validation 1-error:0.04648
        validation 0-logloss:0.15190
                                         validation_0-error:0.03451
[51]
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
        validation_0-logloss:0.14876
[53]
                                         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
        validation_0-logloss:0.14545
[55]
                                         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
        validation 0-logloss:0.14286
[57]
                                         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
validation_1-logloss:0.17297
                                 validation_1-error:0.04498
        validation_0-logloss:0.14042
                                         validation 0-error:0.03301
[59]
validation_1-logloss:0.17234
                                 validation_1-error:0.04498
        validation_0-logloss:0.13956
[60]
                                         validation_0-error:0.03263
validation_1-logloss:0.17170
                                 validation_1-error:0.04498
        validation_0-logloss:0.13818
                                         validation_0-error:0.03263
[61]
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
        validation_0-logloss:0.13532
                                         validation_0-error:0.03188
[64]
validation_1-logloss:0.16940
                                validation_1-error:0.04348
        validation_0-logloss:0.13464
                                         validation_0-error:0.03188
[65]
validation 1-logloss:0.16881
                                validation 1-error:0.04498
        validation 0-logloss:0.13395
                                         validation 0-error:0.03188
[66]
validation 1-logloss:0.16795
                                validation 1-error:0.04498
[67]
        validation_0-logloss:0.13287
                                         validation_0-error:0.03188
validation 1-logloss:0.16752
                                validation 1-error:0.04348
        validation_0-logloss:0.13187
                                         validation_0-error:0.03188
validation_1-logloss:0.16701
                                validation_1-error:0.04498
        validation_0-logloss:0.13085
                                         validation_0-error:0.03188
[69]
validation_1-logloss:0.16690
                                validation_1-error:0.04498
        validation_0-logloss:0.12984
                                        validation_0-error:0.03113
[70]
validation_1-logloss:0.16671
                                validation_1-error:0.04498
        validation_0-logloss:0.12863
                                         validation_0-error:0.03113
[71]
validation_1-logloss:0.16634
                                validation_1-error:0.04498
        validation_0-logloss:0.12783
                                         validation_0-error:0.03113
[72]
validation_1-logloss:0.16626
                                validation 1-error:0.04648
[73]
        validation 0-logloss:0.12698
                                         validation 0-error:0.03076
validation 1-logloss:0.16649
                                validation 1-error:0.04648
        validation 0-logloss:0.12624
[74]
                                         validation 0-error:0.03076
validation_1-logloss:0.16659
                                validation_1-error:0.04648
        validation_0-logloss:0.65348
                                         validation_0-error:0.05064
validation_1-logloss:0.65465
                                validation_1-error:0.06747
        validation_0-logloss:0.61768
                                         validation_0-error:0.05026
[1]
validation_1-logloss:0.61976
                                validation_1-error:0.06747
        validation_0-logloss:0.58481
                                        validation_0-error:0.04876
validation_1-logloss:0.58796
                                validation 1-error:0.06297
        validation_0-logloss:0.55494
                                         validation_0-error:0.04876
validation_1-logloss:0.55910
                                validation_1-error:0.06297
        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
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:0.50257
                                        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
        validation_0-logloss:0.45817
                                         validation_0-error:0.04689
[7]
validation_1-logloss:0.46544
                                 validation 1-error:0.06297
        validation 0-logloss:0.43836
                                         validation 0-error:0.04614
[8]
validation 1-logloss:0.44638
                                 validation 1-error:0.06447
        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
validation_1-logloss:0.41250
                                 validation_1-error:0.06447
        validation_0-logloss:0.38723
                                         validation_0-error:0.04539
[11]
validation_1-logloss:0.39698
                                 validation_1-error:0.06447
        validation_0-logloss:0.37242
                                         validation_0-error:0.04501
[12]
validation_1-logloss:0.38215
                                 validation_1-error:0.06297
        validation_0-logloss:0.35861
[13]
                                         validation_0-error:0.04501
validation_1-logloss:0.36896
                                 validation_1-error:0.06297
[14]
        validation_0-logloss:0.34576
                                         validation_0-error:0.04576
validation_1-logloss:0.35613
                                 validation_1-error:0.06297
[15]
        validation_0-logloss:0.33358
                                         validation_0-error:0.04576
validation 1-logloss:0.34445
                                 validation 1-error:0.06297
        validation_0-logloss:0.32137
                                         validation 0-error:0.04576
validation 1-logloss:0.33266
                                 validation 1-error:0.06297
        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
        validation_0-logloss:0.28978
                                         validation_0-error:0.04276
[19]
validation_1-logloss:0.30225
                                 validation_1-error:0.06147
[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
validation_1-logloss:0.28482
                                 validation_1-error:0.06147
[22]
        validation_0-logloss:0.26336
                                         validation_0-error:0.03976
validation_1-logloss:0.27677
                                 validation 1-error:0.05847
        validation 0-logloss:0.25574
                                         validation 0-error:0.03939
validation 1-logloss:0.26933
                                 validation 1-error:0.05847
        validation 0-logloss:0.24844
                                         validation 0-error:0.03788
[24]
validation_1-logloss:0.26245
                                 validation 1-error:0.05397
        validation_0-logloss:0.24151
                                         validation_0-error:0.03788
[25]
validation_1-logloss:0.25601
                                 validation 1-error:0.05247
        validation_0-logloss:0.23508
                                         validation_0-error:0.03751
[26]
validation_1-logloss:0.24927
                                 validation_1-error:0.05247
[27]
        validation_0-logloss:0.22920
                                         validation_0-error:0.03751
                                 validation_1-error:0.05247
validation_1-logloss:0.24359
        validation_0-logloss:0.22341
[28]
                                         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
        validation_0-logloss:0.20821
                                         validation_0-error:0.03601
[31]
validation_1-logloss:0.22356
                                 validation 1-error:0.05247
        validation 0-logloss:0.20377
                                         validation 0-error:0.03601
Γ321
validation 1-logloss:0.21941
                                 validation 1-error:0.05097
        validation 0-logloss:0.19939
                                         validation 0-error:0.03563
validation_1-logloss:0.21574
                                 validation 1-error:0.05097
        validation_0-logloss:0.19515
                                         validation 0-error:0.03563
[34]
                                 validation_1-error:0.05097
validation_1-logloss:0.21227
        validation_0-logloss:0.19137
                                         validation_0-error:0.03601
[35]
validation_1-logloss:0.20891
                                 validation_1-error:0.05097
        validation_0-logloss:0.18789
[36]
                                         validation_0-error:0.03526
validation_1-logloss:0.20633
                                 validation 1-error:0.04947
        validation_0-logloss:0.18432
[37]
                                         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
        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
        validation_0-logloss:0.16749
                                         validation_0-error:0.03413
[43]
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
        validation 0-logloss:0.15868
                                         validation 0-error:0.03301
validation 1-logloss:0.18113
                                 validation 1-error:0.04648
        validation 0-logloss:0.15685
                                         validation 0-error:0.03301
[48]
validation_1-logloss:0.17999
                                 validation 1-error:0.04648
[49]
        validation_0-logloss:0.15498
                                         validation_0-error:0.03301
validation_1-logloss:0.17784
                                 validation 1-error:0.04648
        validation_0-logloss:0.15307
                                         validation_0-error:0.03263
[50]
validation_1-logloss:0.17595
                                 validation_1-error:0.04798
[51]
        validation_0-logloss:0.15141
                                         validation_0-error:0.03226
validation_1-logloss:0.17413
                                 validation 1-error:0.04798
        validation_0-logloss:0.14978
[52]
                                         validation_0-error:0.03226
validation_1-logloss:0.17289
                                 validation_1-error:0.04798
[53]
        validation_0-logloss:0.14802
                                         validation_0-error:0.03226
validation_1-logloss:0.17203
                                 validation_1-error:0.04648
```

```
[54]
        validation_0-logloss:0.14649
                                         validation_0-error:0.03226
validation_1-logloss:0.17061
                                 validation_1-error:0.04498
        validation_0-logloss:0.14507
[55]
                                         validation_0-error:0.03151
validation_1-logloss:0.16930
                                 validation 1-error:0.04648
        validation 0-logloss:0.14379
                                         validation 0-error:0.03151
[56]
validation 1-logloss:0.16799
                                 validation 1-error:0.04648
        validation 0-logloss:0.14245
                                         validation 0-error:0.03151
validation_1-logloss:0.16701
                                 validation 1-error:0.04648
[58]
        validation_0-logloss:0.14089
                                         validation 0-error:0.03113
validation_1-logloss:0.16622
                                 validation_1-error:0.04648
        validation_0-logloss:0.13969
                                         validation_0-error:0.03113
[59]
validation_1-logloss:0.16504
                                 validation_1-error:0.04648
        validation_0-logloss:0.13855
                                         validation_0-error:0.03113
[60]
validation_1-logloss:0.16402
                                 validation 1-error:0.04648
        validation_0-logloss:0.13717
[61]
                                         validation_0-error:0.03038
validation_1-logloss:0.16342
                                 validation_1-error:0.04648
[62]
        validation_0-logloss:0.13609
                                         validation_0-error:0.03076
validation_1-logloss:0.16232
                                 validation_1-error:0.04648
[63]
        validation 0-logloss:0.13487
                                         validation_0-error:0.03038
validation 1-logloss:0.16137
                                 validation 1-error:0.04648
        validation 0-logloss:0.13338
                                         validation 0-error:0.03001
validation 1-logloss:0.16022
                                 validation 1-error:0.04648
        validation_0-logloss:0.13224
                                         validation_0-error:0.03001
validation_1-logloss:0.15952
                                 validation 1-error:0.04648
[66]
        validation_0-logloss:0.13105
                                         validation_0-error:0.03001
validation_1-logloss:0.15913
                                 validation_1-error:0.04648
[67]
        validation_0-logloss:0.13029
                                         validation_0-error:0.03001
validation_1-logloss:0.15851
                                 validation_1-error:0.04498
[68]
        validation_0-logloss:0.12938
                                         validation_0-error:0.02963
validation_1-logloss:0.15738
                                 validation_1-error:0.04498
[69]
        validation_0-logloss:0.12867
                                         validation_0-error:0.02963
validation_1-logloss:0.15724
                                 validation_1-error:0.04498
[70]
        validation_0-logloss:0.12793
                                         validation_0-error:0.02888
validation 1-logloss:0.15672
                                 validation 1-error:0.04348
        validation 0-logloss:0.12676
                                         validation 0-error:0.02851
validation 1-logloss:0.15635
                                 validation 1-error:0.04348
[72]
        validation 0-logloss:0.12588
                                         validation 0-error:0.02851
validation_1-logloss:0.15553
                                 validation 1-error:0.04348
        validation_0-logloss:0.12491
                                         validation_0-error:0.02851
[73]
validation_1-logloss:0.15536
                                 validation 1-error:0.04348
        validation_0-logloss:0.12431
                                         validation_0-error:0.02851
[74]
validation_1-logloss:0.15483
                                 validation_1-error:0.04348
[0]
        validation_0-logloss:0.65361
                                         validation_0-error:0.04801
validation_1-logloss:0.65491
                                 validation 1-error:0.06447
        validation_0-logloss:0.61788
[1]
                                         validation_0-error:0.04726
validation_1-logloss:0.62047
                                 validation_1-error:0.06147
[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
        validation_0-logloss:0.52831
                                         validation_0-error:0.04726
[4]
validation_1-logloss:0.53382
                                 validation 1-error:0.06147
        validation 0-logloss:0.50329
                                         validation 0-error:0.04764
[5]
validation 1-logloss:0.50931
                                 validation 1-error:0.06297
        validation 0-logloss:0.48026
                                         validation 0-error:0.04876
validation_1-logloss:0.48664
                                 validation 1-error:0.06447
        validation_0-logloss:0.45888
                                         validation 0-error:0.04764
validation_1-logloss:0.46626
                                 validation_1-error:0.06297
        validation_0-logloss:0.43899
                                         validation_0-error:0.04726
[8]
validation_1-logloss:0.44708
                                 validation_1-error:0.06147
        validation_0-logloss:0.42043
                                         validation_0-error:0.04726
validation_1-logloss:0.42892
                                 validation_1-error:0.06147
        validation_0-logloss:0.40344
[10]
                                         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
validation_1-logloss:0.39711
                                 validation_1-error:0.06147
[12]
        validation_0-logloss:0.37263
                                         validation_0-error:0.04689
validation 1-logloss:0.38235
                                 validation 1-error:0.06147
                                         validation 0-error:0.04689
        validation_0-logloss:0.35879
validation 1-logloss:0.36900
                                 validation 1-error:0.06147
        validation_0-logloss:0.34606
                                         validation_0-error:0.04689
validation_1-logloss:0.35692
                                 validation 1-error:0.06147
[15]
        validation_0-logloss:0.33409
                                         validation_0-error:0.04689
validation_1-logloss:0.34522
                                 validation_1-error:0.06147
        validation_0-logloss:0.32290
                                         validation_0-error:0.04689
[16]
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
        validation 0-logloss:0.28130
                                         validation 0-error:0.04501
[20]
validation 1-logloss:0.29290
                                 validation 1-error:0.05397
        validation 0-logloss:0.27240
                                         validation 0-error:0.04426
[21]
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
[24]
        validation_0-logloss:0.24843
                                         validation_0-error:0.04239
validation_1-logloss:0.26122
                                 validation 1-error:0.04947
        validation_0-logloss:0.24170
[25]
                                         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
        validation_0-logloss:0.22340
                                         validation_0-error:0.04163
[28]
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
        validation 0-logloss:0.21280
                                         validation 0-error:0.03901
validation_1-logloss:0.22755
                                 validation 1-error:0.04648
        validation_0-logloss:0.20842
                                         validation 0-error:0.03864
[31]
validation_1-logloss:0.22326
                                 validation_1-error:0.04648
        validation_0-logloss:0.20386
                                         validation_0-error:0.03788
[32]
validation_1-logloss:0.21887
                                 validation_1-error:0.04648
        validation_0-logloss:0.19958
[33]
                                         validation_0-error:0.03788
validation_1-logloss:0.21502
                                 validation 1-error:0.04648
        validation_0-logloss:0.19528
[34]
                                         validation_0-error:0.03713
validation_1-logloss:0.21128
                                 validation_1-error:0.04348
[35]
        validation_0-logloss:0.19186
                                         validation_0-error:0.03713
validation_1-logloss:0.20786
                                 validation_1-error:0.04498
[36]
        validation_0-logloss:0.18798
                                         validation_0-error:0.03638
validation 1-logloss:0.20433
                                 validation 1-error:0.04648
        validation 0-logloss:0.18424
                                         validation 0-error:0.03263
validation 1-logloss:0.20097
                                 validation 1-error:0.04498
        validation_0-logloss:0.18135
                                         validation_0-error:0.03376
validation 1-logloss:0.19793
                                 validation 1-error:0.04348
[39]
        validation_0-logloss:0.17803
                                         validation_0-error:0.03301
validation_1-logloss:0.19517
                                 validation_1-error:0.04198
[40]
        validation_0-logloss:0.17507
                                         validation_0-error:0.03151
validation_1-logloss:0.19259
                                 validation_1-error:0.04198
[41]
        validation_0-logloss:0.17263
                                         validation 0-error:0.03076
validation_1-logloss:0.19006
                                 validation_1-error:0.04048
[42]
        validation_0-logloss:0.16989
                                         validation_0-error:0.03076
                                 validation_1-error:0.04048
validation_1-logloss:0.18773
[43]
        validation_0-logloss:0.16775
                                         validation_0-error:0.03076
validation 1-logloss:0.18565
                                 validation 1-error:0.04048
        validation 0-logloss:0.16519
                                         validation 0-error:0.03076
[44]
validation 1-logloss:0.18362
                                 validation 1-error:0.03898
        validation 0-logloss:0.16323
                                         validation 0-error:0.03076
[45]
validation_1-logloss:0.18160
                                 validation 1-error:0.03898
        validation_0-logloss:0.16093
                                         validation_0-error:0.03076
[46]
validation_1-logloss:0.17970
                                 validation 1-error:0.03898
        validation_0-logloss:0.15896
                                         validation_0-error:0.03038
[47]
validation_1-logloss:0.17802
                                 validation_1-error:0.03898
[48]
        validation_0-logloss:0.15690
                                         validation_0-error:0.03038
validation_1-logloss:0.17671
                                 validation 1-error:0.03898
        validation_0-logloss:0.15492
[49]
                                         validation_0-error:0.03038
validation_1-logloss:0.17509
                                 validation_1-error:0.03898
[50]
        validation_0-logloss:0.15305
                                         validation_0-error:0.03038
validation_1-logloss:0.17344
                                 validation_1-error:0.03898
```

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[51]
        validation_0-logloss:0.15136
                                         validation_0-error:0.03001
validation_1-logloss:0.17157
                                 validation_1-error:0.03898
        validation_0-logloss:0.14953
[52]
                                         validation_0-error:0.02963
validation_1-logloss:0.17035
                                 validation 1-error:0.03898
        validation 0-logloss:0.14800
                                         validation 0-error:0.02963
[53]
validation 1-logloss:0.16894
                                 validation 1-error:0.03898
        validation 0-logloss:0.14653
                                         validation 0-error:0.02963
validation_1-logloss:0.16751
                                 validation 1-error:0.03898
        validation_0-logloss:0.14516
                                         validation 0-error:0.02963
[55]
validation_1-logloss:0.16618
                                 validation_1-error:0.03898
        validation_0-logloss:0.14380
                                         validation_0-error:0.02963
[56]
validation_1-logloss:0.16481
                                 validation_1-error:0.04048
        validation_0-logloss:0.14230
[57]
                                         validation_0-error:0.02926
validation_1-logloss:0.16406
                                 validation_1-error:0.03898
        validation_0-logloss:0.14106
[58]
                                         validation_0-error:0.02888
validation_1-logloss:0.16286
                                 validation_1-error:0.03898
[59]
        validation_0-logloss:0.13968
                                         validation_0-error:0.02851
validation_1-logloss:0.16215
                                 validation_1-error:0.03898
[60]
        validation_0-logloss:0.13853
                                         validation_0-error:0.02851
validation 1-logloss:0.16127
                                 validation 1-error:0.03898
                                         validation 0-error:0.02851
        validation_0-logloss:0.13748
validation 1-logloss:0.16041
                                 validation 1-error:0.03898
[62]
        validation_0-logloss:0.13621
                                         validation_0-error:0.02888
validation_1-logloss:0.15919
                                 validation_1-error:0.03898
[63]
        validation_0-logloss:0.13456
                                         validation_0-error:0.02813
validation_1-logloss:0.15885
                                 validation_1-error:0.03898
        validation_0-logloss:0.13340
                                         validation_0-error:0.02851
[64]
validation_1-logloss:0.15780
                                 validation_1-error:0.03898
[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
        validation 0-logloss:0.12838
                                         validation 0-error:0.02888
validation 1-logloss:0.15520
                                 validation 1-error:0.03898
        validation 0-logloss:0.12744
                                         validation 0-error:0.02888
[69]
validation_1-logloss:0.15417
                                 validation 1-error:0.03898
        validation_0-logloss:0.12612
                                         validation_0-error:0.02851
[70]
validation_1-logloss:0.15395
                                 validation 1-error:0.03898
        validation_0-logloss:0.12513
                                         validation_0-error:0.02851
[71]
validation_1-logloss:0.15309
                                 validation_1-error:0.03898
[72]
        validation_0-logloss:0.12425
                                         validation_0-error:0.02851
validation_1-logloss:0.15282
                                 validation 1-error:0.03898
        validation_0-logloss:0.12365
[73]
                                         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
```

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[75]
        validation_0-logloss:0.12210
                                        validation_0-error:0.02813
validation_1-logloss:0.15162
                                validation_1-error:0.03898
        validation_0-logloss:0.12126
                                        validation_0-error:0.02813
[76]
validation 1-logloss:0.15160
                                validation 1-error:0.03898
        validation 0-logloss:0.12037
                                         validation 0-error:0.02813
[77]
validation 1-logloss:0.15137
                                validation 1-error:0.03748
        validation 0-logloss:0.11989
                                         validation_0-error:0.02776
validation_1-logloss:0.15104
                                 validation 1-error:0.03748
        validation_0-logloss:0.11927
                                         validation 0-error:0.02738
[79]
validation_1-logloss:0.15082
                                validation_1-error:0.03748
        validation_0-logloss:0.11868
[80]
                                         validation_0-error:0.02738
validation_1-logloss:0.15059
                                validation_1-error:0.03748
        validation_0-logloss:0.11809
                                         validation_0-error:0.02738
[81]
validation 1-logloss:0.15066
                                validation_1-error:0.03748
        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
        validation 0-logloss:0.11601
                                        validation 0-error:0.02738
validation 1-logloss:0.14950
                                validation 1-error:0.03748
        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
        validation 0-logloss:0.11335
[89]
                                         validation 0-error:0.02701
validation 1-logloss:0.14879
                                validation 1-error:0.03898
        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
        validation_0-logloss:0.58454
                                         validation_0-error:0.04801
[2]
validation_1-logloss:0.58712
                                validation_1-error:0.05997
        validation_0-logloss:0.55450
                                         validation_0-error:0.04801
[3]
validation_1-logloss:0.55758
                                validation_1-error:0.05997
        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
        validation_0-logloss:0.47838
                                         validation_0-error:0.04501
[6]
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
        validation 0-logloss:0.43717
                                         validation 0-error:0.04501
                                 validation_1-error:0.05097
validation 1-logloss:0.44212
[9]
        validation_0-logloss:0.41881
                                         validation 0-error:0.04501
validation 1-logloss:0.42422
                                 validation 1-error:0.04947
                                         validation_0-error:0.04539
[10]
        validation_0-logloss:0.40164
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
        validation_0-logloss:0.37106
                                         validation_0-error:0.04539
[12]
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
        validation_0-logloss:0.34431
                                         validation_0-error:0.04539
validation_1-logloss:0.35132
                                 validation 1-error:0.04947
Γ15]
        validation 0-logloss:0.33159
                                         validation 0-error:0.04539
validation 1-logloss:0.33863
                                 validation 1-error:0.04947
        validation 0-logloss:0.31977
                                         validation 0-error:0.04464
[16]
validation_1-logloss:0.32678
                                 validation_1-error:0.05097
        validation_0-logloss:0.30858
                                         validation_0-error:0.04464
[17]
validation_1-logloss:0.31574
                                 validation_1-error:0.05247
        validation_0-logloss:0.29821
                                         validation_0-error:0.04426
[18]
validation_1-logloss:0.30545
                                 validation_1-error:0.05247
        validation_0-logloss:0.28861
[19]
                                         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
        validation_0-logloss:0.27094
[21]
                                         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
        validation 0-logloss:0.25540
[23]
                                         validation 0-error:0.04314
validation 1-logloss:0.26310
                                 validation 1-error:0.05097
Γ241
        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
        validation_0-logloss:0.23556
                                         validation_0-error:0.03976
[26]
validation_1-logloss:0.24374
                                 validation_1-error:0.04798
        validation_0-logloss:0.22964
                                         validation_0-error:0.03939
[27]
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
        validation_0-logloss:0.20867
                                         validation_0-error:0.03713
[31]
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
        validation_0-logloss:0.18745
                                         validation_0-error:0.03826
[36]
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
        validation 0-logloss:0.17447
[40]
                                         validation 0-error:0.03826
validation_1-logloss:0.19058
                                 validation_1-error:0.04498
        validation 0-logloss:0.17156
                                         validation 0-error:0.03676
[41]
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
        validation_0-logloss:0.16659
[43]
                                         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
        validation_0-logloss:0.16184
[45]
                                         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
        validation 0-logloss:0.15796
[47]
                                         validation 0-error:0.03563
validation 1-logloss:0.17555
                                 validation 1-error:0.04348
۲481
        validation_0-logloss:0.15607
                                         validation 0-error:0.03451
validation_1-logloss:0.17372
                                 validation_1-error:0.04348
        validation_0-logloss:0.15431
[49]
                                         validation 0-error:0.03451
validation_1-logloss:0.17220
                                 validation_1-error:0.04198
[50]
        validation_0-logloss:0.15281
                                         validation_0-error:0.03376
validation_1-logloss:0.17037
                                 validation_1-error:0.04348
        validation_0-logloss:0.15095
                                         validation_0-error:0.03226
[51]
validation_1-logloss:0.16928
                                 validation_1-error:0.04348
[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
```

```
validation_1-logloss:0.16629
                                 validation_1-error:0.04048
[54]
        validation_0-logloss:0.14681
                                         validation_0-error:0.03338
validation_1-logloss:0.16487
                                 validation_1-error:0.04048
        validation_0-logloss:0.14518
                                         validation_0-error:0.03338
[55]
validation 1-logloss:0.16381
                                 validation 1-error:0.04048
        validation 0-logloss:0.14407
                                         validation 0-error:0.03301
[56]
validation 1-logloss:0.16247
                                 validation 1-error:0.04048
[57]
        validation_0-logloss:0.14303
                                         validation_0-error:0.03263
validation 1-logloss:0.16165
                                 validation 1-error:0.03898
[58]
        validation_0-logloss:0.14164
                                         validation_0-error:0.03301
validation_1-logloss:0.16081
                                 validation_1-error:0.03898
[59]
        validation_0-logloss:0.14080
                                         validation_0-error:0.03338
validation_1-logloss:0.15999
                                 validation_1-error:0.03898
        validation_0-logloss:0.13921
                                         validation_0-error:0.03263
[60]
validation_1-logloss:0.15913
                                 validation_1-error:0.04048
[61]
        validation_0-logloss:0.13833
                                         validation_0-error:0.03226
validation_1-logloss:0.15808
                                 validation_1-error:0.04048
[62]
        validation_0-logloss:0.13693
                                         validation_0-error:0.03188
validation_1-logloss:0.15721
                                 validation 1-error:0.04048
[63]
        validation 0-logloss:0.13589
                                         validation 0-error:0.03188
validation 1-logloss:0.15661
                                 validation 1-error:0.04048
        validation 0-logloss:0.13489
[64]
                                         validation 0-error:0.03188
validation_1-logloss:0.15564
                                 validation_1-error:0.04048
        validation_0-logloss:0.13401
                                         validation_0-error:0.03226
[65]
validation_1-logloss:0.15494
                                 validation_1-error:0.04048
        validation_0-logloss:0.13320
                                         validation_0-error:0.03226
[66]
validation_1-logloss:0.15462
                                 validation_1-error:0.04048
        validation_0-logloss:0.13250
[67]
                                         validation_0-error:0.03188
validation_1-logloss:0.15375
                                 validation 1-error:0.03898
[68]
        validation_0-logloss:0.13161
                                         validation_0-error:0.03226
validation_1-logloss:0.15315
                                 validation_1-error:0.04048
[69]
        validation_0-logloss:0.13085
                                         validation_0-error:0.03188
validation_1-logloss:0.15258
                                 validation_1-error:0.04048
[70]
        validation_0-logloss:0.12960
                                         validation_0-error:0.03113
validation 1-logloss:0.15211
                                 validation 1-error:0.04048
        validation 0-logloss:0.12889
[71]
                                         validation 0-error:0.03076
validation 1-logloss:0.15161
                                 validation 1-error:0.04048
[72]
        validation_0-logloss:0.12831
                                         validation 0-error:0.03076
validation_1-logloss:0.15144
                                 validation_1-error:0.04048
        validation_0-logloss:0.12780
                                         validation 0-error:0.03151
[73]
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
```

```
validation_1-logloss:0.14999
                                validation_1-error:0.04048
        validation_0-logloss:0.12451
                                         validation_0-error:0.03113
[78]
validation_1-logloss:0.14954
                                validation_1-error:0.03748
        validation 0-logloss:0.12380
                                         validation 0-error:0.03001
[79]
validation 1-logloss:0.14932
                                validation 1-error:0.04048
        validation 0-logloss:0.12320
                                         validation 0-error:0.03038
[80]
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
        validation_0-logloss:0.12164
                                         validation_0-error:0.03001
[83]
validation_1-logloss:0.14836
                                validation_1-error:0.03748
        validation_0-logloss:0.12111
                                        validation_0-error:0.03001
validation_1-logloss:0.14847
                                validation_1-error:0.03898
        validation_0-logloss:0.12052
                                         validation_0-error:0.03001
[85]
validation_1-logloss:0.14808
                                validation_1-error:0.03748
        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
        validation 0-logloss:0.11925
[88]
                                         validation 0-error:0.03001
validation_1-logloss:0.14775
                                validation_1-error:0.03748
        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
        validation 0-logloss:0.61795
                                         validation 0-error:0.05176
validation 1-logloss:0.61848
                                validation 1-error:0.05397
        validation 0-logloss:0.58546
                                         validation 0-error:0.05214
validation_1-logloss:0.58611
                                validation 1-error:0.05247
        validation_0-logloss:0.55559
                                         validation_0-error:0.05139
[3]
validation_1-logloss:0.55699
                                validation 1-error:0.05547
        validation_0-logloss:0.52842
                                         validation_0-error:0.05251
validation_1-logloss:0.53003
                                validation_1-error:0.05097
        validation_0-logloss:0.50329
                                         validation_0-error:0.05251
validation_1-logloss:0.50553
                                validation 1-error:0.05097
        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
        validation_0-logloss:0.41971
                                         validation_0-error:0.04614
[9]
validation_1-logloss:0.42423
                                 validation 1-error:0.05397
Γ107
        validation 0-logloss:0.40215
                                         validation 0-error:0.04651
validation 1-logloss:0.40692
                                 validation 1-error:0.05397
        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-error:0.05697
validation_1-logloss:0.37611
        validation_0-logloss:0.35640
                                         validation_0-error:0.04201
[13]
validation_1-logloss:0.36233
                                 validation_1-error:0.05547
        validation_0-logloss:0.34279
[14]
                                         validation_0-error:0.04163
validation_1-logloss:0.34910
                                 validation 1-error:0.05697
        validation_0-logloss:0.33004
[15]
                                         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
        validation 0-logloss:0.29663
                                         validation 0-error:0.03713
validation 1-logloss:0.30448
                                 validation 1-error:0.05097
Г197
        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
        validation_0-logloss:0.26873
                                         validation_0-error:0.03526
[21]
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
        validation 0-logloss:0.23911
                                         validation 0-error:0.03488
validation 1-logloss:0.25048
                                 validation 1-error:0.04498
        validation 0-logloss:0.23287
                                         validation 0-error:0.03301
[26]
validation_1-logloss:0.24489
                                 validation 1-error:0.04348
        validation_0-logloss:0.22700
                                         validation_0-error:0.03413
[27]
validation_1-logloss:0.23937
                                 validation 1-error:0.04348
        validation_0-logloss:0.22145
                                         validation_0-error:0.03376
[28]
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
        validation_0-logloss:0.21115
[30]
                                         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
        validation_0-logloss:0.19778
[33]
                                         validation_0-error:0.03151
validation_1-logloss:0.21306
                                 validation 1-error:0.04498
        validation 0-logloss:0.19406
                                         validation 0-error:0.03151
Γ341
validation 1-logloss:0.20982
                                 validation 1-error:0.04348
        validation 0-logloss:0.19040
                                         validation 0-error:0.03151
validation_1-logloss:0.20626
                                 validation 1-error:0.04348
        validation_0-logloss:0.18694
                                         validation 0-error:0.03038
[36]
validation_1-logloss:0.20312
                                 validation_1-error:0.04348
        validation_0-logloss:0.18370
                                         validation_0-error:0.03113
[37]
validation_1-logloss:0.20022
                                 validation_1-error:0.04348
        validation_0-logloss:0.18042
[38]
                                         validation_0-error:0.03113
validation_1-logloss:0.19740
                                 validation_1-error:0.04498
        validation_0-logloss:0.17786
[39]
                                         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
                                         validation 0-error:0.03001
        validation_0-logloss:0.16932
validation 1-logloss:0.18827
                                 validation 1-error:0.04498
        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
        validation_0-logloss:0.16225
                                         validation_0-error:0.02926
[45]
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
        validation 0-logloss:0.15450
                                         validation 0-error:0.02851
validation 1-logloss:0.17550
                                 validation 1-error:0.04348
        validation 0-logloss:0.15276
                                         validation 0-error:0.02851
[50]
validation_1-logloss:0.17418
                                 validation 1-error:0.04348
        validation_0-logloss:0.15103
                                         validation_0-error:0.02813
[51]
validation_1-logloss:0.17233
                                 validation 1-error:0.04348
        validation_0-logloss:0.14950
                                         validation_0-error:0.02813
[52]
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
        validation_0-logloss:0.14632
[54]
                                         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
        validation_0-logloss:0.14207
[57]
                                         validation_0-error:0.02813
validation_1-logloss:0.16542
                                 validation 1-error:0.04048
        validation 0-logloss:0.14094
                                         validation 0-error:0.02813
[58]
validation 1-logloss:0.16431
                                 validation 1-error:0.04048
        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
        validation_0-logloss:0.13679
                                         validation_0-error:0.02701
[61]
validation_1-logloss:0.16168
                                 validation_1-error:0.04048
        validation_0-logloss:0.13575
[62]
                                         validation_0-error:0.02701
validation_1-logloss:0.16074
                                 validation 1-error:0.04048
        validation_0-logloss:0.13429
[63]
                                         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
        validation_0-logloss:0.13027
                                         validation 0-error:0.02701
validation 1-logloss:0.15866
                                 validation 1-error:0.04198
        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-error:0.04048
validation_1-logloss:0.15527
[72]
        validation_0-logloss:0.12424
                                         validation_0-error:0.02738
validation 1-logloss:0.15523
                                 validation 1-error:0.03898
        validation 0-logloss:0.12350
                                         validation 0-error:0.02701
validation 1-logloss:0.15431
                                 validation 1-error:0.03898
        validation 0-logloss:0.12263
                                         validation 0-error:0.02663
[74]
validation_1-logloss:0.15373
                                 validation 1-error:0.03748
        validation_0-logloss:0.12207
                                         validation_0-error:0.02701
[75]
validation_1-logloss:0.15366
                                 validation 1-error:0.03748
        validation_0-logloss:0.12143
                                         validation_0-error:0.02701
[76]
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
        validation_0-logloss:0.12011
[78]
                                         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
```

```
[08]
        validation_0-logloss:0.11882
                                         validation_0-error:0.02588
validation_1-logloss:0.15221
                                validation_1-error:0.03748
        validation_0-logloss:0.11804
                                         validation_0-error:0.02588
[81]
validation 1-logloss:0.15218
                                validation 1-error:0.03748
        validation 0-logloss:0.11749
                                         validation 0-error:0.02626
[82]
validation 1-logloss:0.15185
                                validation 1-error:0.03748
        validation 0-logloss:0.11700
                                         validation_0-error:0.02588
validation_1-logloss:0.15145
                                 validation 1-error:0.03748
        validation_0-logloss:0.11646
                                         validation 0-error:0.02551
[84]
validation_1-logloss:0.15115
                                validation_1-error:0.03748
        validation_0-logloss:0.11576
[85]
                                         validation_0-error:0.02626
validation_1-logloss:0.15097
                                validation_1-error:0.03748
        validation_0-logloss:0.11534
                                         validation_0-error:0.02588
[86]
                                validation_1-error:0.03748
validation 1-logloss:0.15089
        validation_0-logloss:0.11478
[87]
                                         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)
        validation_0-logloss:0.65329
                                         validation_0-error:0.04989
[0]
validation_1-logloss:0.65464
                                validation 1-error:0.07046
        validation_0-logloss:0.61719
                                         validation_0-error:0.04914
validation_1-logloss:0.61986
                                validation_1-error:0.07046
        validation_0-logloss:0.58435
                                         validation_0-error:0.04914
validation_1-logloss:0.58815
                                validation_1-error:0.07046
        validation_0-logloss:0.55429
                                         validation_0-error:0.04839
[3]
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
        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
        validation_0-logloss:0.45709
                                         validation_0-error:0.04951
[7]
validation_1-logloss:0.46511
                                validation_1-error:0.07196
        validation_0-logloss:0.43709
                                         validation_0-error:0.04876
[8]
validation_1-logloss:0.44518
                                validation_1-error:0.07196
        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
        validation_0-logloss:0.38526
                                         validation_0-error:0.04726
[11]
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
        validation 0-logloss:0.35624
                                         validation 0-error:0.04689
[13]
validation 1-logloss:0.36802
                                 validation_1-error:0.07046
Γ14]
        validation_0-logloss:0.34321
                                         validation 0-error:0.04576
validation 1-logloss:0.35536
                                 validation 1-error:0.06897
                                         validation_0-error:0.04576
[15]
        validation_0-logloss:0.33110
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
        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
        validation 0-logloss:0.27152
[21]
                                         validation 0-error:0.04651
validation_1-logloss:0.28640
                                 validation_1-error:0.06447
        validation_0-logloss:0.26336
                                         validation_0-error:0.04314
[22]
validation_1-logloss:0.27858
                                 validation_1-error:0.05997
        validation_0-logloss:0.25574
                                         validation_0-error:0.04126
[23]
validation_1-logloss:0.27129
                                 validation_1-error:0.05997
        validation_0-logloss:0.24857
[24]
                                         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
        validation_0-logloss:0.23549
[26]
                                         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
        validation 0-logloss:0.22400
[28]
                                         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
        validation_0-logloss:0.20934
                                         validation_0-error:0.03788
[31]
validation_1-logloss:0.22536
                                 validation_1-error:0.05247
        validation_0-logloss:0.20497
                                         validation_0-error:0.03751
[32]
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
        validation_0-logloss:0.18935
                                         validation_0-error:0.03676
[36]
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
        validation_0-logloss:0.17375
                                         validation_0-error:0.03563
[41]
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
Γ441
        validation 0-logloss:0.16636
                                         validation 0-error:0.03563
validation 1-logloss:0.18861
                                 validation 1-error:0.04798
        validation 0-logloss:0.16421
                                         validation 0-error:0.03563
[45]
validation_1-logloss:0.18730
                                 validation 1-error:0.04648
        validation_0-logloss:0.16179
                                         validation_0-error:0.03526
[46]
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
        validation_0-logloss:0.15734
                                         validation_0-error:0.03526
[48]
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
        validation 0-logloss:0.14999
[52]
                                         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
        validation_0-logloss:0.14705
                                         validation 0-error:0.03413
Γ541
validation_1-logloss:0.17690
                                 validation_1-error:0.04648
        validation_0-logloss:0.14545
                                         validation_0-error:0.03376
[55]
validation_1-logloss:0.17591
                                 validation_1-error:0.04648
        validation_0-logloss:0.14439
                                         validation_0-error:0.03376
[56]
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
```

```
validation_1-logloss:0.17297
                                 validation_1-error:0.04498
[59]
        validation_0-logloss:0.14042
                                         validation_0-error:0.03301
validation_1-logloss:0.17234
                                 validation_1-error:0.04498
[60]
        validation_0-logloss:0.13956
                                         validation_0-error:0.03263
validation 1-logloss:0.17170
                                 validation 1-error:0.04498
        validation 0-logloss:0.13818
                                         validation 0-error:0.03263
[61]
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
                                         validation_0-error:0.03226
[63]
        validation_0-logloss:0.13664
validation_1-logloss:0.17013
                                 validation_1-error:0.04498
[64]
        validation_0-logloss:0.13532
                                         validation_0-error:0.03188
validation_1-logloss:0.16940
                                 validation_1-error:0.04348
        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
validation_1-logloss:0.16752
                                 validation 1-error:0.04348
[68]
        validation 0-logloss:0.13187
                                         validation 0-error:0.03188
validation 1-logloss:0.16701
                                 validation 1-error:0.04498
        validation 0-logloss:0.13085
                                         validation 0-error:0.03188
[69]
validation_1-logloss:0.16690
                                 validation 1-error:0.04498
        validation_0-logloss:0.12984
                                         validation_0-error:0.03113
[70]
validation_1-logloss:0.16671
                                 validation_1-error:0.04498
        validation_0-logloss:0.12863
                                         validation_0-error:0.03113
[71]
validation_1-logloss:0.16634
                                 validation_1-error:0.04498
        validation_0-logloss:0.12783
[72]
                                         validation_0-error:0.03113
validation_1-logloss:0.16626
                                 validation 1-error:0.04648
[73]
        validation_0-logloss:0.12698
                                         validation_0-error:0.03076
validation_1-logloss:0.16649
                                 validation_1-error:0.04648
        validation_0-logloss:0.12624
                                         validation_0-error:0.03076
validation_1-logloss:0.16659
                                 validation_1-error:0.04648
[75]
        validation_0-logloss:0.12555
                                         validation_0-error:0.03038
validation 1-logloss:0.16679
                                 validation 1-error:0.04648
        validation 0-logloss:0.12473
[76]
                                         validation 0-error:0.03038
validation 1-logloss:0.16648
                                 validation_1-error:0.04648
[77]
        validation_0-logloss:0.12404
                                         validation 0-error:0.03038
validation_1-logloss:0.16668
                                 validation_1-error:0.04648
        validation_0-logloss:0.12341
                                         validation 0-error:0.03038
[78]
validation_1-logloss:0.16619
                                 validation_1-error:0.04498
        validation_0-logloss:0.12256
[79]
                                         validation_0-error:0.03038
validation_1-logloss:0.16591
                                 validation_1-error:0.04498
        validation_0-logloss:0.12199
                                         validation_0-error:0.03038
[80]
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
        validation_0-logloss:0.12034
                                         validation_0-error:0.03038
[83]
validation_1-logloss:0.16481
                                validation_1-error:0.04348
        validation_0-logloss:0.11983
                                         validation_0-error:0.03038
[84]
validation 1-logloss:0.16483
                                validation 1-error:0.04348
        validation 0-logloss:0.11936
                                         validation 0-error:0.03076
[85]
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
        validation_0-logloss:0.11825
                                         validation_0-error:0.03038
validation_1-logloss:0.16460
                                validation_1-error:0.04348
        validation_0-logloss:0.11780
                                         validation_0-error:0.03076
[88]
validation_1-logloss:0.16423
                                validation_1-error:0.04348
        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
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)
        validation_0-logloss:0.65348
                                        validation 0-error:0.05064
[0]
validation_1-logloss:0.65465
                                validation_1-error:0.06747
        validation_0-logloss:0.61768
                                         validation_0-error:0.05026
[1]
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
        validation 0-logloss:0.55494
                                         validation 0-error:0.04876
validation 1-logloss:0.55910
                                validation 1-error:0.06297
        validation 0-logloss:0.52767
                                         validation 0-error:0.04876
validation_1-logloss:0.53243
                                validation_1-error:0.06297
        validation_0-logloss:0.50257
                                         validation_0-error:0.04764
[5]
validation_1-logloss:0.50833
                                validation 1-error:0.06447
        validation_0-logloss:0.47952
                                         validation_0-error:0.04764
validation_1-logloss:0.48595
                                validation_1-error:0.06297
        validation_0-logloss:0.45817
                                         validation_0-error:0.04689
validation_1-logloss:0.46544
                                validation 1-error:0.06297
        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
validation_1-logloss:0.41250
                                 validation_1-error:0.06447
        validation_0-logloss:0.38723
                                         validation_0-error:0.04539
[11]
validation_1-logloss:0.39698
                                 validation 1-error:0.06447
Γ127
        validation 0-logloss:0.37242
                                         validation 0-error:0.04501
validation 1-logloss:0.38215
                                 validation 1-error:0.06297
        validation 0-logloss:0.35861
                                         validation 0-error:0.04501
validation_1-logloss:0.36896
                                 validation 1-error:0.06297
        validation_0-logloss:0.34576
                                         validation 0-error:0.04576
[14]
validation_1-logloss:0.35613
                                 validation_1-error:0.06297
        validation_0-logloss:0.33358
                                         validation_0-error:0.04576
[15]
validation_1-logloss:0.34445
                                 validation_1-error:0.06297
        validation_0-logloss:0.32137
[16]
                                         validation_0-error:0.04576
validation_1-logloss:0.33266
                                 validation_1-error:0.06297
        validation_0-logloss:0.31016
[17]
                                         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
validation 1-logloss:0.30225
                                 validation 1-error:0.06147
        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
validation_1-logloss:0.28482
                                 validation_1-error:0.06147
[22]
        validation_0-logloss:0.26336
                                         validation_0-error:0.03976
validation_1-logloss:0.27677
                                 validation_1-error:0.05847
        validation_0-logloss:0.25574
                                         validation_0-error:0.03939
[23]
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
        validation 0-logloss:0.22920
                                         validation 0-error:0.03751
validation 1-logloss:0.24359
                                 validation 1-error:0.05247
        validation 0-logloss:0.22341
                                         validation 0-error:0.03751
[28]
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
        validation_0-logloss:0.21304
                                         validation_0-error:0.03751
[30]
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
        validation_0-logloss:0.20377
[32]
                                         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
```

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[34]
        validation_0-logloss:0.19515
                                         validation_0-error:0.03563
validation_1-logloss:0.21227
                                 validation_1-error:0.05097
        validation_0-logloss:0.19137
                                         validation_0-error:0.03601
[35]
validation_1-logloss:0.20891
                                 validation 1-error:0.05097
        validation 0-logloss:0.18789
                                         validation 0-error:0.03526
[36]
validation 1-logloss:0.20633
                                 validation 1-error:0.04947
        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-error:0.04798
validation_1-logloss:0.20043
        validation_0-logloss:0.17839
                                         validation_0-error:0.03451
[39]
validation_1-logloss:0.19793
                                 validation_1-error:0.04798
        validation_0-logloss:0.17549
                                         validation_0-error:0.03451
[40]
validation_1-logloss:0.19565
                                 validation 1-error:0.04798
        validation_0-logloss:0.17268
[41]
                                         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
                                         validation_0-error:0.03413
[43]
        validation_0-logloss:0.16749
validation 1-logloss:0.18880
                                 validation 1-error:0.04648
        validation 0-logloss:0.16512
                                         validation 0-error:0.03338
validation 1-logloss:0.18697
                                 validation 1-error:0.04798
        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
        validation_0-logloss:0.15685
[48]
                                         validation_0-error:0.03301
validation_1-logloss:0.17999
                                 validation_1-error:0.04648
[49]
        validation_0-logloss:0.15498
                                         validation_0-error:0.03301
validation_1-logloss:0.17784
                                 validation_1-error:0.04648
[50]
        validation_0-logloss:0.15307
                                         validation_0-error:0.03263
validation 1-logloss:0.17595
                                 validation 1-error:0.04798
        validation 0-logloss:0.15141
                                         validation 0-error:0.03226
[51]
validation 1-logloss:0.17413
                                 validation 1-error:0.04798
[52]
        validation 0-logloss:0.14978
                                         validation 0-error:0.03226
validation_1-logloss:0.17289
                                 validation 1-error:0.04798
[53]
        validation_0-logloss:0.14802
                                         validation_0-error:0.03226
validation_1-logloss:0.17203
                                 validation 1-error:0.04648
        validation_0-logloss:0.14649
                                         validation_0-error:0.03226
[54]
validation_1-logloss:0.17061
                                 validation_1-error:0.04498
[55]
        validation_0-logloss:0.14507
                                         validation_0-error:0.03151
validation_1-logloss:0.16930
                                 validation 1-error:0.04648
        validation_0-logloss:0.14379
[56]
                                         validation_0-error:0.03151
validation_1-logloss:0.16799
                                 validation_1-error:0.04648
[57]
        validation_0-logloss:0.14245
                                         validation_0-error:0.03151
validation_1-logloss:0.16701
                                 validation_1-error:0.04648
```

```
[58]
        validation_0-logloss:0.14089
                                         validation_0-error:0.03113
validation_1-logloss:0.16622
                                 validation_1-error:0.04648
        validation_0-logloss:0.13969
[59]
                                         validation_0-error:0.03113
validation_1-logloss:0.16504
                                 validation 1-error:0.04648
        validation 0-logloss:0.13855
                                         validation 0-error:0.03113
[60]
validation 1-logloss:0.16402
                                 validation 1-error:0.04648
        validation 0-logloss:0.13717
                                         validation 0-error:0.03038
validation_1-logloss:0.16342
                                 validation 1-error:0.04648
[62]
        validation_0-logloss:0.13609
                                         validation 0-error:0.03076
                                 validation_1-error:0.04648
validation_1-logloss:0.16232
        validation_0-logloss:0.13487
                                         validation_0-error:0.03038
[63]
validation_1-logloss:0.16137
                                 validation_1-error:0.04648
        validation_0-logloss:0.13338
                                         validation_0-error:0.03001
[64]
validation_1-logloss:0.16022
                                 validation 1-error:0.04648
        validation_0-logloss:0.13224
[65]
                                         validation_0-error:0.03001
validation_1-logloss:0.15952
                                 validation_1-error:0.04648
[66]
        validation_0-logloss:0.13105
                                         validation_0-error:0.03001
validation_1-logloss:0.15913
                                 validation_1-error:0.04648
                                         validation_0-error:0.03001
[67]
        validation_0-logloss:0.13029
validation 1-logloss:0.15851
                                 validation 1-error:0.04498
        validation 0-logloss:0.12938
                                         validation 0-error:0.02963
validation 1-logloss:0.15738
                                 validation 1-error:0.04498
        validation_0-logloss:0.12867
                                         validation_0-error:0.02963
validation_1-logloss:0.15724
                                 validation_1-error:0.04498
[70]
        validation_0-logloss:0.12793
                                         validation_0-error:0.02888
validation_1-logloss:0.15672
                                 validation_1-error:0.04348
        validation_0-logloss:0.12676
                                         validation_0-error:0.02851
[71]
validation_1-logloss:0.15635
                                 validation_1-error:0.04348
[72]
        validation_0-logloss:0.12588
                                         validation_0-error:0.02851
validation_1-logloss:0.15553
                                 validation_1-error:0.04348
[73]
        validation_0-logloss:0.12491
                                         validation_0-error:0.02851
validation_1-logloss:0.15536
                                 validation_1-error:0.04348
[74]
        validation_0-logloss:0.12431
                                         validation_0-error:0.02851
validation 1-logloss:0.15483
                                 validation 1-error:0.04348
        validation 0-logloss:0.12370
                                         validation 0-error:0.02813
validation 1-logloss:0.15454
                                 validation 1-error:0.04348
        validation 0-logloss:0.12261
                                         validation 0-error:0.02851
[76]
validation_1-logloss:0.15429
                                 validation 1-error:0.04348
        validation_0-logloss:0.12203
                                         validation_0-error:0.02851
[77]
validation_1-logloss:0.15383
                                 validation 1-error:0.04348
        validation_0-logloss:0.12156
                                         validation_0-error:0.02851
[78]
validation_1-logloss:0.15367
                                 validation_1-error:0.04348
[79]
        validation_0-logloss:0.12080
                                         validation_0-error:0.02851
validation_1-logloss:0.15328
                                 validation 1-error:0.04348
        validation_0-logloss:0.11997
[80]
                                         validation_0-error:0.02851
validation_1-logloss:0.15349
                                 validation_1-error:0.04348
[81]
        validation_0-logloss:0.11951
                                         validation_0-error:0.02851
validation_1-logloss:0.15331
                                 validation_1-error:0.04348
```

```
[82]
        validation_0-logloss:0.11868
                                         validation_0-error:0.02851
validation_1-logloss:0.15313
                                 validation_1-error:0.04498
        validation_0-logloss:0.11826
[83]
                                         validation_0-error:0.02851
validation_1-logloss:0.15310
                                 validation 1-error:0.04348
        validation 0-logloss:0.11774
                                         validation 0-error:0.02851
Г841
validation 1-logloss:0.15288
                                 validation 1-error:0.04498
        validation 0-logloss:0.11739
                                         validation 0-error:0.02851
validation_1-logloss:0.15282
                                 validation 1-error:0.04348
[86]
        validation_0-logloss:0.11680
                                         validation 0-error:0.02851
validation_1-logloss:0.15255
                                 validation_1-error:0.04198
        validation_0-logloss:0.11589
                                         validation_0-error:0.02813
[87]
validation_1-logloss:0.15250
                                 validation_1-error:0.04198
        validation_0-logloss:0.11552
[88]
                                         validation_0-error:0.02776
validation_1-logloss:0.15267
                                 validation_1-error:0.04348
        validation_0-logloss:0.11465
[89]
                                         validation_0-error:0.02776
validation_1-logloss:0.15259
                                 validation_1-error:0.04198
[0]
        validation_0-logloss:0.65361
                                         validation_0-error:0.04801
validation_1-logloss:0.65491
                                 validation_1-error:0.06447
                                         validation_0-error:0.04726
[1]
        validation_0-logloss:0.61788
validation 1-logloss:0.62047
                                 validation 1-error:0.06147
        validation_0-logloss:0.58535
                                         validation 0-error:0.04914
validation 1-logloss:0.58902
                                 validation 1-error:0.06447
        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
validation_1-logloss:0.53382
                                 validation_1-error:0.06147
        validation_0-logloss:0.50329
                                         validation_0-error:0.04764
[5]
validation_1-logloss:0.50931
                                 validation_1-error:0.06297
[6]
        validation_0-logloss:0.48026
                                         validation_0-error:0.04876
validation_1-logloss:0.48664
                                 validation_1-error:0.06447
        validation_0-logloss:0.45888
                                         validation_0-error:0.04764
[7]
validation_1-logloss:0.46626
                                 validation_1-error:0.06297
[8]
        validation_0-logloss:0.43899
                                         validation_0-error:0.04726
validation_1-logloss:0.44708
                                 validation 1-error:0.06147
        validation 0-logloss:0.42043
                                         validation 0-error:0.04726
validation 1-logloss:0.42892
                                 validation 1-error:0.06147
        validation 0-logloss:0.40344
                                         validation 0-error:0.04726
[10]
validation_1-logloss:0.41277
                                 validation 1-error:0.06147
        validation_0-logloss:0.38752
                                         validation_0-error:0.04726
[11]
validation_1-logloss:0.39711
                                 validation 1-error:0.06147
        validation_0-logloss:0.37263
                                         validation_0-error:0.04689
[12]
validation_1-logloss:0.38235
                                 validation_1-error:0.06147
[13]
        validation_0-logloss:0.35879
                                         validation_0-error:0.04689
validation_1-logloss:0.36900
                                 validation 1-error:0.06147
        validation_0-logloss:0.34606
[14]
                                         validation_0-error:0.04689
validation_1-logloss:0.35692
                                 validation_1-error:0.06147
[15]
        validation_0-logloss:0.33409
                                         validation_0-error:0.04689
validation_1-logloss:0.34522
                                 validation_1-error:0.06147
```

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Γ16]
        validation_0-logloss:0.32290
                                         validation_0-error:0.04689
validation_1-logloss:0.33432
                                 validation_1-error:0.06147
        validation_0-logloss:0.31134
                                         validation_0-error:0.04689
[17]
validation_1-logloss:0.32267
                                 validation 1-error:0.06147
        validation 0-logloss:0.30070
                                         validation 0-error:0.04689
Г187
validation 1-logloss:0.31197
                                 validation 1-error:0.06147
        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-error:0.05397
validation_1-logloss:0.29290
        validation_0-logloss:0.27240
                                         validation_0-error:0.04426
[21]
validation_1-logloss:0.28427
                                 validation_1-error:0.05247
        validation_0-logloss:0.26386
                                         validation_0-error:0.04389
[22]
validation_1-logloss:0.27605
                                 validation 1-error:0.05247
        validation_0-logloss:0.25586
[23]
                                         validation_0-error:0.04351
validation_1-logloss:0.26821
                                 validation_1-error:0.05247
[24]
        validation_0-logloss:0.24843
                                         validation_0-error:0.04239
validation_1-logloss:0.26122
                                 validation_1-error:0.04947
                                         validation_0-error:0.04163
[25]
        validation_0-logloss:0.24170
validation 1-logloss:0.25455
                                 validation 1-error:0.04947
                                         validation 0-error:0.04201
        validation 0-logloss:0.23512
validation 1-logloss:0.24846
                                 validation 1-error:0.04947
        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
validation_1-logloss:0.22326
                                 validation_1-error:0.04648
[32]
        validation_0-logloss:0.20386
                                         validation_0-error:0.03788
validation 1-logloss:0.21887
                                 validation 1-error:0.04648
        validation 0-logloss:0.19958
                                         validation 0-error:0.03788
validation 1-logloss:0.21502
                                 validation 1-error:0.04648
        validation 0-logloss:0.19528
                                         validation 0-error:0.03713
[34]
validation_1-logloss:0.21128
                                 validation 1-error:0.04348
        validation_0-logloss:0.19186
                                         validation_0-error:0.03713
[35]
validation_1-logloss:0.20786
                                 validation 1-error:0.04498
        validation_0-logloss:0.18798
                                         validation_0-error:0.03638
[36]
validation_1-logloss:0.20433
                                 validation_1-error:0.04648
[37]
        validation_0-logloss:0.18424
                                         validation_0-error:0.03263
validation_1-logloss:0.20097
                                 validation 1-error:0.04498
        validation_0-logloss:0.18135
[38]
                                         validation_0-error:0.03376
validation_1-logloss:0.19793
                                 validation_1-error:0.04348
[39]
        validation_0-logloss:0.17803
                                         validation_0-error:0.03301
validation_1-logloss:0.19517
                                 validation_1-error:0.04198
```

```
[40]
        validation_0-logloss:0.17507
                                         validation_0-error:0.03151
validation_1-logloss:0.19259
                                 validation_1-error:0.04198
        validation_0-logloss:0.17263
                                         validation_0-error:0.03076
[41]
validation_1-logloss:0.19006
                                 validation 1-error:0.04048
[42]
        validation 0-logloss:0.16989
                                         validation 0-error:0.03076
validation 1-logloss:0.18773
                                 validation 1-error:0.04048
        validation 0-logloss:0.16775
                                         validation 0-error:0.03076
validation_1-logloss:0.18565
                                 validation 1-error:0.04048
[44]
        validation_0-logloss:0.16519
                                         validation 0-error:0.03076
validation_1-logloss:0.18362
                                 validation_1-error:0.03898
        validation_0-logloss:0.16323
                                         validation_0-error:0.03076
[45]
validation_1-logloss:0.18160
                                 validation_1-error:0.03898
        validation_0-logloss:0.16093
                                         validation_0-error:0.03076
[46]
validation_1-logloss:0.17970
                                 validation 1-error:0.03898
        validation_0-logloss:0.15896
[47]
                                         validation_0-error:0.03038
validation_1-logloss:0.17802
                                 validation_1-error:0.03898
[48]
        validation_0-logloss:0.15690
                                         validation_0-error:0.03038
validation_1-logloss:0.17671
                                 validation_1-error:0.03898
[49]
        validation_0-logloss:0.15492
                                         validation_0-error:0.03038
validation 1-logloss:0.17509
                                 validation 1-error:0.03898
        validation_0-logloss:0.15305
                                         validation 0-error:0.03038
validation 1-logloss:0.17344
                                 validation 1-error:0.03898
[51]
        validation_0-logloss:0.15136
                                         validation_0-error:0.03001
validation_1-logloss:0.17157
                                 validation 1-error:0.03898
[52]
        validation_0-logloss:0.14953
                                         validation_0-error:0.02963
validation_1-logloss:0.17035
                                 validation_1-error:0.03898
        validation_0-logloss:0.14800
                                         validation_0-error:0.02963
[53]
validation_1-logloss:0.16894
                                 validation_1-error:0.03898
[54]
        validation_0-logloss:0.14653
                                         validation_0-error:0.02963
validation_1-logloss:0.16751
                                 validation_1-error:0.03898
[55]
        validation_0-logloss:0.14516
                                         validation_0-error:0.02963
validation_1-logloss:0.16618
                                 validation_1-error:0.03898
[56]
        validation_0-logloss:0.14380
                                         validation_0-error:0.02963
validation 1-logloss:0.16481
                                 validation 1-error:0.04048
        validation 0-logloss:0.14230
                                         validation 0-error:0.02926
validation 1-logloss:0.16406
                                 validation 1-error:0.03898
        validation 0-logloss:0.14106
                                         validation 0-error:0.02888
[58]
validation_1-logloss:0.16286
                                 validation 1-error:0.03898
[59]
        validation_0-logloss:0.13968
                                         validation_0-error:0.02851
validation_1-logloss:0.16215
                                 validation 1-error:0.03898
        validation_0-logloss:0.13853
                                         validation_0-error:0.02851
[60]
validation_1-logloss:0.16127
                                 validation_1-error:0.03898
[61]
        validation_0-logloss:0.13748
                                         validation_0-error:0.02851
validation_1-logloss:0.16041
                                 validation 1-error:0.03898
        validation_0-logloss:0.13621
[62]
                                         validation_0-error:0.02888
validation_1-logloss:0.15919
                                 validation_1-error:0.03898
[63]
        validation_0-logloss:0.13456
                                         validation_0-error:0.02813
validation_1-logloss:0.15885
                                 validation_1-error:0.03898
```

```
[64]
        validation_0-logloss:0.13340
                                        validation_0-error:0.02851
validation_1-logloss:0.15780
                                validation_1-error:0.03898
        validation_0-logloss:0.13195
[65]
                                        validation_0-error:0.02813
validation 1-logloss:0.15733
                                validation 1-error:0.03898
        validation 0-logloss:0.13083
                                         validation 0-error:0.02851
[66]
validation 1-logloss:0.15637
                                validation 1-error:0.03898
        validation 0-logloss:0.12939
                                         validation 0-error:0.02851
validation_1-logloss:0.15599
                                 validation 1-error:0.03898
        validation_0-logloss:0.12838
                                         validation 0-error:0.02888
[68]
validation_1-logloss:0.15520
                                validation_1-error:0.03898
        validation_0-logloss:0.12744
                                         validation_0-error:0.02888
[69]
validation_1-logloss:0.15417
                                validation_1-error:0.03898
        validation_0-logloss:0.12612
[70]
                                         validation_0-error:0.02851
validation 1-logloss:0.15395
                                validation 1-error:0.03898
        validation_0-logloss:0.12513
[71]
                                         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
validation_1-logloss:0.15282
                                validation_1-error:0.03898
[73]
        validation 0-logloss:0.12365
                                         validation_0-error:0.02851
validation 1-logloss:0.15227
                                validation 1-error:0.03898
        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
        validation_0-logloss:0.12037
                                         validation_0-error:0.02813
[77]
validation_1-logloss:0.15137
                                validation_1-error:0.03748
                                         validation_0-error:0.02776
        validation_0-logloss:0.11989
[78]
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
        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
        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
[88]
        validation_0-logloss:0.11396
                                         validation_0-error:0.02701
validation 1-logloss:0.14887
                                 validation 1-error:0.03898
        validation_0-logloss:0.11335
[89]
                                         validation_0-error:0.02701
validation_1-logloss:0.14879
                                 validation_1-error:0.03898
[90]
        validation_0-logloss:0.11308
                                         validation_0-error:0.02701
validation_1-logloss:0.14841
                                 validation_1-error:0.03748
        validation_0-logloss:0.11217
                                         validation_0-error:0.02701
[91]
validation_1-logloss:0.14815
                                 validation_1-error:0.03748
[92]
        validation_0-logloss:0.11170
                                         validation_0-error:0.02701
validation_1-logloss:0.14813
                                 validation_1-error:0.03748
[93]
        validation_0-logloss:0.11077
                                         validation_0-error:0.02701
validation 1-logloss:0.14794
                                 validation 1-error:0.03748
Г941
        validation 0-logloss:0.11031
                                         validation 0-error:0.02701
validation 1-logloss:0.14762
                                 validation 1-error:0.03748
        validation 0-logloss:0.10952
                                         validation 0-error:0.02701
[95]
validation_1-logloss:0.14773
                                 validation 1-error:0.03748
        validation_0-logloss:0.10925
                                         validation_0-error:0.02701
[96]
validation_1-logloss:0.14738
                                 validation_1-error:0.03598
        validation_0-logloss:0.10878
                                         validation_0-error:0.02701
[97]
validation_1-logloss:0.14742
                                 validation_1-error:0.03598
        validation_0-logloss:0.10839
                                         validation_0-error:0.02663
[98]
validation_1-logloss:0.14721
                                 validation 1-error:0.03598
[99]
        validation_0-logloss:0.10773
                                         validation_0-error:0.02663
validation_1-logloss:0.14690
                                 validation_1-error:0.03598
[100]
        validation_0-logloss:0.10744
                                         validation_0-error:0.02626
validation_1-logloss:0.14682
                                 validation_1-error:0.03598
[101]
        validation_0-logloss:0.10677
                                         validation_0-error:0.02626
validation 1-logloss:0.14684
                                 validation 1-error:0.03598
        validation 0-logloss:0.10610
[102]
                                         validation 0-error:0.02626
validation 1-logloss:0.14628
                                 validation 1-error:0.03598
Γ1037
        validation_0-logloss:0.10586
                                         validation 0-error:0.02626
validation_1-logloss:0.14635
                                 validation_1-error:0.03748
        validation_0-logloss:0.10523
                                         validation 0-error:0.02626
Γ1047
validation_1-logloss:0.14662
                                 validation_1-error:0.03748
        validation_0-logloss:0.10480
[105]
                                         validation_0-error:0.02626
validation_1-logloss:0.14641
                                 validation_1-error:0.03598
[106]
        validation_0-logloss:0.10457
                                         validation_0-error:0.02626
validation_1-logloss:0.14646
                                 validation_1-error:0.03598
[107]
        validation_0-logloss:0.10427
                                         validation_0-error:0.02626
validation_1-logloss:0.14669
                                 validation_1-error:0.03598
[108]
        validation_0-logloss:0.10368
                                         validation_0-error:0.02626
```

```
validation_1-logloss:0.14643
                                 validation_1-error:0.03598
        validation_0-logloss:0.10307
                                         validation_0-error:0.02626
[109]
validation_1-logloss:0.14648
                                 validation_1-error:0.03748
[110]
        validation_0-logloss:0.10256
                                         validation_0-error:0.02626
validation 1-logloss:0.14625
                                 validation 1-error:0.03898
[111]
        validation 0-logloss:0.10215
                                         validation 0-error:0.02626
validation 1-logloss:0.14596
                                 validation 1-error:0.03898
[112]
        validation_0-logloss:0.10146
                                         validation_0-error:0.02626
validation 1-logloss:0.14613
                                 validation 1-error:0.03898
                                         validation_0-error:0.02626
[113]
        validation_0-logloss:0.10115
validation_1-logloss:0.14602
                                 validation_1-error:0.03898
[114]
        validation_0-logloss:0.10097
                                         validation_0-error:0.02588
validation_1-logloss:0.14612
                                 validation_1-error:0.03898
        validation_0-logloss:0.10076
                                         validation_0-error:0.02588
[115]
validation_1-logloss:0.14628
                                 validation_1-error:0.03898
[116]
        validation_0-logloss:0.10033
                                         validation_0-error:0.02588
validation_1-logloss:0.14610
                                 validation_1-error:0.03748
[117]
        validation_0-logloss:0.10018
                                         validation_0-error:0.02588
validation 1-logloss:0.14624
                                 validation 1-error:0.03898
Γ1187
        validation 0-logloss:0.09988
                                         validation 0-error:0.02588
validation 1-logloss:0.14620
                                 validation 1-error:0.03748
        validation 0-logloss:0.09964
                                         validation 0-error:0.02551
[119]
validation_1-logloss:0.14613
                                 validation 1-error:0.03748
        validation 0-logloss:0.65340
                                         validation_0-error:0.04839
validation_1-logloss:0.65419
                                 validation_1-error:0.05997
        validation_0-logloss:0.61735
                                         validation_0-error:0.04764
[1]
validation_1-logloss:0.61899
                                 validation_1-error:0.05997
        validation_0-logloss:0.58454
                                         validation_0-error:0.04801
[2]
validation_1-logloss:0.58712
                                 validation 1-error:0.05997
        validation_0-logloss:0.55450
                                         validation_0-error:0.04801
validation_1-logloss:0.55758
                                 validation_1-error:0.05997
        validation_0-logloss:0.52703
                                         validation_0-error:0.04801
validation_1-logloss:0.53044
                                 validation_1-error:0.05997
        validation_0-logloss:0.50170
                                         validation_0-error:0.04501
[5]
validation 1-logloss:0.50581
                                 validation 1-error:0.05397
        validation 0-logloss:0.47838
[6]
                                         validation 0-error:0.04501
validation 1-logloss:0.48278
                                 validation_1-error:0.05247
        validation_0-logloss:0.45691
                                         validation 0-error:0.04539
[7]
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
        validation_0-logloss:0.41881
                                         validation_0-error:0.04501
[9]
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
        validation 0-logloss:0.33159
                                         validation 0-error:0.04539
[15]
validation 1-logloss:0.33863
                                 validation 1-error:0.04947
Г16Ъ
        validation_0-logloss:0.31977
                                         validation 0-error:0.04464
validation 1-logloss:0.32678
                                 validation 1-error:0.05097
                                         validation_0-error:0.04464
[17]
        validation_0-logloss:0.30858
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
        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
        validation 0-logloss:0.25540
                                         validation 0-error:0.04314
[23]
validation_1-logloss:0.26310
                                 validation_1-error:0.05097
        validation_0-logloss:0.24837
                                         validation_0-error:0.04239
[24]
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
        validation_0-logloss:0.23556
                                         validation_0-error:0.03976
[26]
validation_1-logloss:0.24374
                                 validation 1-error:0.04798
[27]
        validation_0-logloss:0.22964
                                         validation_0-error:0.03939
validation_1-logloss:0.23813
                                 validation_1-error:0.04798
        validation_0-logloss:0.22388
[28]
                                         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
        validation 0-logloss:0.21363
[30]
                                         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
        validation_0-logloss:0.20403
[32]
                                         validation 0-error:0.03713
validation_1-logloss:0.21490
                                 validation_1-error:0.04198
        validation_0-logloss:0.19949
                                         validation_0-error:0.03788
[33]
validation_1-logloss:0.21128
                                 validation_1-error:0.04198
        validation_0-logloss:0.19518
                                         validation_0-error:0.03826
[34]
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
        validation_0-logloss:0.18063
                                         validation_0-error:0.03788
[38]
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
Γ401
        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
        validation_0-logloss:0.16659
                                         validation_0-error:0.03638
[43]
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
Γ461
        validation 0-logloss:0.15995
                                         validation 0-error:0.03601
validation 1-logloss:0.17748
                                 validation 1-error:0.04498
        validation 0-logloss:0.15796
[47]
                                         validation 0-error:0.03563
validation_1-logloss:0.17555
                                 validation_1-error:0.04348
        validation_0-logloss:0.15607
                                         validation 0-error:0.03451
[48]
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
        validation_0-logloss:0.15281
[50]
                                         validation_0-error:0.03376
validation_1-logloss:0.17037
                                 validation 1-error:0.04348
[51]
        validation_0-logloss:0.15095
                                         validation_0-error:0.03226
validation_1-logloss:0.16928
                                 validation_1-error:0.04348
        validation_0-logloss:0.14942
[52]
                                         validation_0-error:0.03338
validation_1-logloss:0.16785
                                 validation_1-error:0.04198
        validation_0-logloss:0.14813
                                         validation_0-error:0.03301
[53]
validation 1-logloss:0.16629
                                 validation 1-error:0.04048
        validation 0-logloss:0.14681
[54]
                                         validation 0-error:0.03338
validation 1-logloss:0.16487
                                 validation 1-error:0.04048
[55]
        validation_0-logloss:0.14518
                                         validation 0-error:0.03338
validation_1-logloss:0.16381
                                 validation_1-error:0.04048
        validation_0-logloss:0.14407
[56]
                                         validation 0-error:0.03301
validation_1-logloss:0.16247
                                 validation_1-error:0.04048
        validation_0-logloss:0.14303
                                         validation_0-error:0.03263
[57]
validation_1-logloss:0.16165
                                 validation_1-error:0.03898
        validation_0-logloss:0.14164
                                         validation_0-error:0.03301
[58]
validation_1-logloss:0.16081
                                 validation_1-error:0.03898
[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
```

```
validation_1-logloss:0.15913
                                 validation_1-error:0.04048
[61]
        validation_0-logloss:0.13833
                                         validation_0-error:0.03226
validation_1-logloss:0.15808
                                 validation_1-error:0.04048
[62]
        validation_0-logloss:0.13693
                                         validation_0-error:0.03188
validation 1-logloss:0.15721
                                 validation 1-error:0.04048
[63]
        validation 0-logloss:0.13589
                                         validation 0-error:0.03188
validation 1-logloss:0.15661
                                 validation 1-error:0.04048
[64]
        validation_0-logloss:0.13489
                                         validation 0-error:0.03188
validation 1-logloss:0.15564
                                 validation 1-error:0.04048
                                         validation_0-error:0.03226
[65]
        validation_0-logloss:0.13401
validation_1-logloss:0.15494
                                 validation_1-error:0.04048
[66]
        validation_0-logloss:0.13320
                                         validation_0-error:0.03226
validation_1-logloss:0.15462
                                 validation_1-error:0.04048
        validation_0-logloss:0.13250
                                         validation_0-error:0.03188
[67]
validation_1-logloss:0.15375
                                 validation_1-error:0.03898
[68]
        validation_0-logloss:0.13161
                                         validation_0-error:0.03226
validation_1-logloss:0.15315
                                 validation_1-error:0.04048
[69]
        validation_0-logloss:0.13085
                                         validation_0-error:0.03188
validation_1-logloss:0.15258
                                 validation 1-error:0.04048
[70]
        validation 0-logloss:0.12960
                                         validation 0-error:0.03113
validation 1-logloss:0.15211
                                 validation 1-error:0.04048
        validation 0-logloss:0.12889
                                         validation 0-error:0.03076
[71]
validation_1-logloss:0.15161
                                 validation 1-error:0.04048
        validation_0-logloss:0.12831
                                         validation_0-error:0.03076
[72]
validation_1-logloss:0.15144
                                 validation_1-error:0.04048
[73]
        validation_0-logloss:0.12780
                                         validation_0-error:0.03151
validation_1-logloss:0.15124
                                 validation_1-error:0.04048
        validation_0-logloss:0.12698
                                         validation_0-error:0.03038
[74]
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
        validation_0-logloss:0.12571
                                         validation_0-error:0.03076
[76]
validation_1-logloss:0.15000
                                 validation_1-error:0.04048
[77]
        validation_0-logloss:0.12498
                                         validation_0-error:0.03038
validation 1-logloss:0.14999
                                 validation 1-error:0.04048
        validation 0-logloss:0.12451
[78]
                                         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
        validation_0-logloss:0.12320
                                         validation 0-error:0.03038
[80]
validation_1-logloss:0.14930
                                 validation_1-error:0.03898
        validation_0-logloss:0.12275
[81]
                                         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
        validation_0-logloss:0.12052
                                         validation_0-error:0.03001
[85]
validation_1-logloss:0.14808
                                validation_1-error:0.03748
        validation 0-logloss:0.11994
                                         validation 0-error:0.03001
[86]
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
        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
Г941
        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
        validation 0-logloss:0.11367
                                         validation 0-error:0.03001
validation 1-logloss:0.14655
                                validation 1-error:0.03598
        validation 0-logloss:0.11336
                                         validation 0-error:0.03001
validation 1-logloss:0.14654
                                validation 1-error:0.03598
        validation_0-logloss:0.11271
                                         validation_0-error:0.02926
[100]
validation_1-logloss:0.14633
                                validation 1-error:0.03598
        validation_0-logloss:0.11238
                                         validation_0-error:0.02926
[101]
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
        validation_0-logloss:0.11182
[103]
                                         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
validation_1-logloss:0.14589
                                 validation_1-error:0.03448
        validation_0-logloss:0.10991
[106]
                                         validation_0-error:0.02926
validation_1-logloss:0.14606
                                 validation 1-error:0.03448
        validation 0-logloss:0.10968
                                         validation 0-error:0.02926
Γ107]
validation 1-logloss:0.14602
                                 validation 1-error:0.03448
        validation 0-logloss:0.10932
                                         validation 0-error:0.02926
validation_1-logloss:0.14611
                                 validation 1-error:0.03448
        validation_0-logloss:0.10884
                                         validation 0-error:0.02888
[109]
validation_1-logloss:0.14619
                                 validation_1-error:0.03448
        validation_0-logloss:0.10864
                                         validation_0-error:0.02888
[110]
validation_1-logloss:0.14625
                                 validation_1-error:0.03598
        validation_0-logloss:0.10825
                                         validation_0-error:0.02888
[111]
validation_1-logloss:0.14627
                                 validation 1-error:0.03748
        validation_0-logloss:0.10782
[112]
                                         validation_0-error:0.02926
validation_1-logloss:0.14643
                                 validation_1-error:0.03598
[113]
        validation_0-logloss:0.10748
                                         validation_0-error:0.02926
validation_1-logloss:0.14627
                                 validation_1-error:0.03898
[114]
        validation 0-logloss:0.10728
                                         validation_0-error:0.02888
validation 1-logloss:0.14637
                                 validation 1-error:0.03748
[115]
        validation 0-logloss:0.10699
                                         validation 0-error:0.02888
validation 1-logloss:0.14647
                                 validation 1-error:0.03748
[116]
        validation_0-logloss:0.10669
                                         validation_0-error:0.02851
validation 1-logloss:0.14638
                                 validation_1-error:0.03748
[117]
        validation_0-logloss:0.10608
                                         validation_0-error:0.02851
validation_1-logloss:0.14632
                                 validation_1-error:0.03598
        validation_0-logloss:0.10560
                                         validation_0-error:0.02813
[118]
validation_1-logloss:0.14649
                                 validation_1-error:0.03598
        validation_0-logloss:0.10501
                                         validation_0-error:0.02813
[119]
validation_1-logloss:0.14649
                                 validation_1-error:0.03748
        validation_0-logloss:0.65361
                                         validation_0-error:0.05439
[0]
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
        validation 0-logloss:0.58546
                                         validation 0-error:0.05214
validation 1-logloss:0.58611
                                 validation 1-error:0.05247
        validation 0-logloss:0.55559
                                         validation 0-error:0.05139
validation_1-logloss:0.55699
                                 validation 1-error:0.05547
        validation_0-logloss:0.52842
                                         validation_0-error:0.05251
[4]
validation_1-logloss:0.53003
                                 validation 1-error:0.05097
        validation_0-logloss:0.50329
                                         validation_0-error:0.05251
[5]
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
        validation_0-logloss:0.45867
[7]
                                         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
        validation_0-logloss:0.40215
                                         validation_0-error:0.04651
[10]
validation 1-logloss:0.40692
                                 validation 1-error:0.05397
        validation 0-logloss:0.38587
                                         validation 0-error:0.04314
Γ117
validation 1-logloss:0.39117
                                 validation 1-error:0.05547
        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-error:0.05547
validation_1-logloss:0.36233
        validation_0-logloss:0.34279
                                         validation_0-error:0.04163
[14]
validation_1-logloss:0.34910
                                 validation_1-error:0.05697
        validation_0-logloss:0.33004
                                         validation_0-error:0.03901
[15]
validation_1-logloss:0.33680
                                 validation 1-error:0.05547
        validation_0-logloss:0.31811
[16]
                                         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
        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
        validation 0-logloss:0.23287
                                         validation 0-error:0.03301
validation 1-logloss:0.24489
                                 validation 1-error:0.04348
        validation 0-logloss:0.22700
                                         validation 0-error:0.03413
[27]
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
        validation_0-logloss:0.21623
                                         validation_0-error:0.03301
[29]
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
        validation_0-logloss:0.20637
[31]
                                         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
        validation_0-logloss:0.19406
[34]
                                         validation_0-error:0.03151
validation_1-logloss:0.20982
                                 validation 1-error:0.04348
        validation 0-logloss:0.19040
                                         validation 0-error:0.03151
[35]
validation 1-logloss:0.20626
                                 validation 1-error:0.04348
        validation 0-logloss:0.18694
                                         validation 0-error:0.03038
validation_1-logloss:0.20312
                                 validation 1-error:0.04348
        validation_0-logloss:0.18370
                                         validation 0-error:0.03113
[37]
validation_1-logloss:0.20022
                                 validation_1-error:0.04348
        validation_0-logloss:0.18042
                                         validation_0-error:0.03113
[38]
validation_1-logloss:0.19740
                                 validation_1-error:0.04498
        validation_0-logloss:0.17786
                                         validation_0-error:0.03076
[39]
validation_1-logloss:0.19520
                                 validation 1-error:0.04498
        validation_0-logloss:0.17492
[40]
                                         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
        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
        validation_0-logloss:0.16033
                                         validation_0-error:0.02926
[46]
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
        validation 0-logloss:0.15276
                                         validation 0-error:0.02851
[50]
validation 1-logloss:0.17418
                                 validation 1-error:0.04348
        validation 0-logloss:0.15103
                                         validation 0-error:0.02813
[51]
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
        validation_0-logloss:0.14782
                                         validation_0-error:0.02813
[53]
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
        validation_0-logloss:0.14482
[55]
                                         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
        validation_0-logloss:0.14094
[58]
                                         validation_0-error:0.02813
validation_1-logloss:0.16431
                                 validation 1-error:0.04048
        validation 0-logloss:0.13973
                                         validation 0-error:0.02776
[59]
validation 1-logloss:0.16351
                                 validation 1-error:0.04198
        validation 0-logloss:0.13851
                                         validation 0-error:0.02738
validation_1-logloss:0.16218
                                 validation 1-error:0.04048
        validation_0-logloss:0.13679
                                         validation 0-error:0.02701
[61]
validation_1-logloss:0.16168
                                 validation_1-error:0.04048
        validation_0-logloss:0.13575
                                         validation_0-error:0.02701
[62]
validation_1-logloss:0.16074
                                 validation_1-error:0.04048
        validation_0-logloss:0.13429
[63]
                                         validation_0-error:0.02701
validation_1-logloss:0.16013
                                 validation 1-error:0.04048
        validation_0-logloss:0.13281
[64]
                                         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
        validation 0-logloss:0.12932
                                         validation 0-error:0.02701
validation 1-logloss:0.15778
                                 validation 1-error:0.04048
        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
        validation 0-logloss:0.12263
                                         validation 0-error:0.02663
validation 1-logloss:0.15373
                                 validation 1-error:0.03748
        validation 0-logloss:0.12207
                                         validation 0-error:0.02701
[75]
validation_1-logloss:0.15366
                                 validation 1-error:0.03748
        validation_0-logloss:0.12143
                                         validation_0-error:0.02701
[76]
validation_1-logloss:0.15347
                                 validation 1-error:0.03748
        validation_0-logloss:0.12076
                                         validation_0-error:0.02738
[77]
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
        validation_0-logloss:0.11957
[79]
                                         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
        validation 0-logloss:0.11700
                                         validation 0-error:0.02588
[83]
validation 1-logloss:0.15145
                                validation 1-error:0.03748
        validation 0-logloss:0.11646
                                         validation_0-error:0.02551
validation_1-logloss:0.15115
                                 validation 1-error:0.03748
        validation_0-logloss:0.11576
                                         validation 0-error:0.02626
[85]
validation_1-logloss:0.15097
                                validation_1-error:0.03748
        validation_0-logloss:0.11534
[86]
                                         validation_0-error:0.02588
validation_1-logloss:0.15089
                                validation_1-error:0.03748
        validation_0-logloss:0.11478
[87]
                                         validation_0-error:0.02588
validation 1-logloss:0.15076
                                validation_1-error:0.03748
        validation_0-logloss:0.11426
[88]
                                         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
        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)
「947
        validation_0-logloss:0.11151
                                         validation_0-error:0.02663
validation 1-logloss:0.14955
                                validation 1-error:0.03748
        validation 0-logloss:0.11118
[95]
                                         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
        validation_0-logloss:0.10991
                                         validation_0-error:0.02701
[98]
validation_1-logloss:0.14850
                                validation_1-error:0.03898
        validation_0-logloss:0.10958
                                         validation_0-error:0.02701
[99]
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
        validation_0-logloss:0.10847
                                         validation_0-error:0.02701
[102]
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
Γ105]
        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
        validation_0-logloss:0.10626
                                         validation_0-error:0.02626
[108]
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
[1111]
        validation 0-logloss:0.10467
                                         validation 0-error:0.02663
validation 1-logloss:0.14722
                                 validation 1-error:0.03748
        validation 0-logloss:0.10448
[112]
                                         validation 0-error:0.02663
validation_1-logloss:0.14723
                                 validation_1-error:0.03748
        validation_0-logloss:0.10407
                                         validation_0-error:0.02663
[113]
validation_1-logloss:0.14743
                                 validation_1-error:0.03748
        validation_0-logloss:0.10363
                                         validation_0-error:0.02663
[114]
validation_1-logloss:0.14746
                                 validation_1-error:0.03748
        validation_0-logloss:0.10334
[115]
                                         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
        validation_0-logloss:0.10285
[117]
                                         validation_0-error:0.02701
validation_1-logloss:0.14741
                                 validation_1-error:0.03748
        validation_0-logloss:0.10262
                                         validation_0-error:0.02701
[118]
validation 1-logloss:0.14698
                                 validation 1-error:0.03748
        validation 0-logloss:0.10238
[119]
                                         validation 0-error:0.02701
validation 1-logloss:0.14701
                                 validation 1-error:0.03748
        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
        validation_0-logloss:0.58435
                                         validation_0-error:0.04914
[2]
validation_1-logloss:0.58815
                                 validation_1-error:0.07046
        validation_0-logloss:0.55429
                                         validation_0-error:0.04839
[3]
validation_1-logloss:0.55907
                                 validation_1-error:0.07196
        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
        validation_0-logloss:0.47850
                                         validation_0-error:0.04764
[6]
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
        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
        validation_0-logloss:0.37023
                                         validation_0-error:0.04689
[12]
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
Γ15]
        validation 0-logloss:0.33110
                                         validation 0-error:0.04576
validation 1-logloss:0.34383
                                 validation 1-error:0.06897
        validation 0-logloss:0.31977
[16]
                                         validation 0-error:0.04464
validation_1-logloss:0.33376
                                 validation_1-error:0.06897
        validation 0-logloss:0.30924
                                         validation 0-error:0.04389
[17]
validation_1-logloss:0.32373
                                 validation_1-error:0.06897
        validation_0-logloss:0.29882
                                         validation_0-error:0.04464
[18]
validation_1-logloss:0.31355
                                 validation_1-error:0.06597
        validation_0-logloss:0.28907
[19]
                                         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
        validation_0-logloss:0.27152
[21]
                                         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
        validation_0-logloss:0.25574
[23]
                                         validation 0-error:0.04126
validation 1-logloss:0.27129
                                 validation 1-error:0.05997
Γ241
        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
        validation_0-logloss:0.23549
                                         validation_0-error:0.04088
[26]
validation_1-logloss:0.25130
                                 validation_1-error:0.05697
        validation_0-logloss:0.22962
                                         validation_0-error:0.04051
[27]
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
        validation_0-logloss:0.20934
                                         validation_0-error:0.03788
[31]
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
        validation_0-logloss:0.18935
                                         validation_0-error:0.03676
[36]
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
        validation 0-logloss:0.17656
[40]
                                         validation 0-error:0.03601
validation_1-logloss:0.19596
                                 validation_1-error:0.04798
        validation_0-logloss:0.17375
                                         validation_0-error:0.03563
[41]
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
        validation_0-logloss:0.16875
[43]
                                         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
        validation_0-logloss:0.16421
[45]
                                         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
        validation_0-logloss:0.15946
[47]
                                         validation 0-error:0.03526
validation 1-logloss:0.18497
                                 validation 1-error:0.04648
۲481
        validation_0-logloss:0.15734
                                         validation 0-error:0.03526
validation_1-logloss:0.18374
                                 validation_1-error:0.04648
        validation_0-logloss:0.15560
[49]
                                         validation 0-error:0.03488
validation_1-logloss:0.18228
                                 validation_1-error:0.04648
        validation_0-logloss:0.15390
                                         validation_0-error:0.03451
[50]
validation_1-logloss:0.18105
                                 validation_1-error:0.04648
        validation_0-logloss:0.15190
                                         validation_0-error:0.03451
[51]
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
        validation_0-logloss:0.14545
                                         validation_0-error:0.03376
[55]
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
                                         validation_0-error:0.03376
[58]
        validation_0-logloss:0.14192
validation_1-logloss:0.17297
                                 validation_1-error:0.04498
[59]
        validation_0-logloss:0.14042
                                         validation_0-error:0.03301
validation_1-logloss:0.17234
                                 validation_1-error:0.04498
        validation_0-logloss:0.13956
                                         validation_0-error:0.03263
[60]
validation_1-logloss:0.17170
                                 validation_1-error:0.04498
[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
Γ631
        validation 0-logloss:0.13664
                                         validation 0-error:0.03226
validation 1-logloss:0.17013
                                 validation 1-error:0.04498
        validation 0-logloss:0.13532
                                         validation 0-error:0.03188
[64]
validation_1-logloss:0.16940
                                 validation 1-error:0.04348
        validation_0-logloss:0.13464
                                         validation_0-error:0.03188
[65]
validation_1-logloss:0.16881
                                 validation_1-error:0.04498
        validation_0-logloss:0.13395
                                         validation_0-error:0.03188
[66]
validation_1-logloss:0.16795
                                 validation_1-error:0.04498
        validation_0-logloss:0.13287
[67]
                                         validation_0-error:0.03188
validation_1-logloss:0.16752
                                 validation 1-error:0.04348
[68]
        validation_0-logloss:0.13187
                                         validation_0-error:0.03188
validation_1-logloss:0.16701
                                 validation_1-error:0.04498
        validation_0-logloss:0.13085
[69]
                                         validation_0-error:0.03188
validation_1-logloss:0.16690
                                 validation_1-error:0.04498
[70]
        validation_0-logloss:0.12984
                                         validation_0-error:0.03113
validation 1-logloss:0.16671
                                 validation 1-error:0.04498
        validation 0-logloss:0.12863
[71]
                                         validation 0-error:0.03113
validation 1-logloss:0.16634
                                 validation_1-error:0.04498
[72]
        validation_0-logloss:0.12783
                                         validation 0-error:0.03113
validation_1-logloss:0.16626
                                 validation_1-error:0.04648
        validation_0-logloss:0.12698
                                         validation 0-error:0.03076
[73]
validation_1-logloss:0.16649
                                 validation_1-error:0.04648
        validation_0-logloss:0.12624
[74]
                                         validation_0-error:0.03076
validation_1-logloss:0.16659
                                 validation_1-error:0.04648
[75]
        validation_0-logloss:0.12555
                                         validation_0-error:0.03038
validation_1-logloss:0.16679
                                 validation_1-error:0.04648
[76]
        validation_0-logloss:0.12473
                                         validation_0-error:0.03038
validation_1-logloss:0.16648
                                 validation_1-error:0.04648
[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
validation_1-logloss:0.16619
                                 validation_1-error:0.04498
[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
        validation_0-logloss:0.12146
[81]
                                         validation 0-error:0.03038
validation 1-logloss:0.16539
                                 validation 1-error:0.04348
                                         validation_0-error:0.03038
        validation_0-logloss:0.12088
[82]
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
        validation 0-logloss:0.11738
                                         validation 0-error:0.03038
[89]
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
        validation_0-logloss:0.11612
                                         validation_0-error:0.03076
[91]
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
                                         validation_0-error:0.03038
[94]
        validation_0-logloss:0.11435
validation 1-logloss:0.16368
                                 validation 1-error:0.04348
        validation 0-logloss:0.11364
[95]
                                         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
        validation_0-logloss:0.11235
                                         validation 0-error:0.03001
[97]
validation_1-logloss:0.16381
                                 validation_1-error:0.04348
        validation_0-logloss:0.11178
[98]
                                         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
        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)

```
validation 0-logloss:0.11048
                                         validation 0-error:0.03001
validation_1-logloss:0.16369
                                 validation_1-error:0.04498
Γ1027
        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
validation_1-logloss:0.16388
                                 validation_1-error:0.04348
[104]
        validation_0-logloss:0.10920
                                         validation_0-error:0.02963
validation_1-logloss:0.16355
                                 validation_1-error:0.04348
        validation_0-logloss:0.10857
[105]
                                         validation_0-error:0.02963
validation_1-logloss:0.16381
                                 validation_1-error:0.04348
[106]
        validation_0-logloss:0.10832
                                         validation_0-error:0.02926
validation 1-logloss:0.16346
                                 validation 1-error:0.04348
        validation_0-logloss:0.10787
                                         validation_0-error:0.02926
[107]
validation 1-logloss:0.16346
                                 validation 1-error:0.04348
        validation_0-logloss:0.10734
                                         validation_0-error:0.02926
[108]
validation 1-logloss:0.16319
                                 validation 1-error:0.04348
[109]
        validation_0-logloss:0.10687
                                         validation_0-error:0.02888
validation 1-logloss:0.16328
                                 validation 1-error:0.04348
        validation_0-logloss:0.10636
                                         validation_0-error:0.02888
validation 1-logloss:0.16319
                                 validation_1-error:0.04348
[111]
        validation_0-logloss:0.10617
                                         validation_0-error:0.02888
validation_1-logloss:0.16313
                                 validation_1-error:0.04348
[112]
        validation_0-logloss:0.10568
                                         validation_0-error:0.02851
validation_1-logloss:0.16276
                                 validation_1-error:0.04348
        validation_0-logloss:0.10529
                                         validation_0-error:0.02851
[113]
validation_1-logloss:0.16307
                                 validation_1-error:0.04348
        validation_0-logloss:0.10481
                                         validation_0-error:0.02851
validation_1-logloss:0.16298
                                 validation 1-error:0.04348
[115]
        validation_0-logloss:0.10438
                                         validation_0-error:0.02851
validation_1-logloss:0.16323
                                 validation_1-error:0.04348
        validation_0-logloss:0.10391
                                         validation 0-error:0.02813
[116]
validation_1-logloss:0.16306
                                 validation_1-error:0.04198
        validation 0-logloss:0.10353
                                         validation 0-error:0.02813
[117]
validation_1-logloss:0.16340
                                 validation_1-error:0.04198
[118]
        validation_0-logloss:0.10317
                                         validation 0-error:0.02851
validation_1-logloss:0.16357
                                 validation_1-error:0.04198
[119]
        validation_0-logloss:0.10301
                                         validation_0-error:0.02813
validation_1-logloss:0.16346
                                 validation_1-error:0.04198
        validation_0-logloss:0.65348
[0]
                                         validation_0-error:0.05064
validation_1-logloss:0.65465
                                 validation_1-error:0.06747
        validation_0-logloss:0.61768
                                         validation_0-error:0.05026
[1]
```

```
validation_1-logloss:0.61976
                                 validation_1-error:0.06747
        validation_0-logloss:0.58481
                                         validation_0-error:0.04876
[2]
validation_1-logloss:0.58796
                                 validation_1-error:0.06297
        validation_0-logloss:0.55494
                                         validation_0-error:0.04876
[3]
validation 1-logloss:0.55910
                                 validation 1-error:0.06297
        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
                                         validation_0-error:0.04764
        validation_0-logloss:0.47952
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
        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
validation_1-logloss:0.41250
                                 validation 1-error:0.06447
Γ117
        validation 0-logloss:0.38723
                                         validation 0-error:0.04539
validation 1-logloss:0.39698
                                 validation 1-error:0.06447
        validation 0-logloss:0.37242
[12]
                                         validation 0-error:0.04501
validation_1-logloss:0.38215
                                 validation_1-error:0.06297
        validation_0-logloss:0.35861
                                         validation_0-error:0.04501
[13]
validation_1-logloss:0.36896
                                 validation_1-error:0.06297
[14]
        validation_0-logloss:0.34576
                                         validation_0-error:0.04576
validation_1-logloss:0.35613
                                 validation_1-error:0.06297
        validation_0-logloss:0.33358
[15]
                                         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
        validation_0-logloss:0.31016
[17]
                                         validation_0-error:0.04501
validation_1-logloss:0.32201
                                 validation_1-error:0.06297
        validation_0-logloss:0.29962
                                         validation_0-error:0.04351
[18]
validation 1-logloss:0.31167
                                 validation 1-error:0.06147
        validation 0-logloss:0.28978
[19]
                                         validation 0-error:0.04276
validation 1-logloss:0.30225
                                 validation 1-error:0.06147
[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
validation_1-logloss:0.28482
                                 validation_1-error:0.06147
[22]
        validation_0-logloss:0.26336
                                         validation_0-error:0.03976
validation_1-logloss:0.27677
                                 validation_1-error:0.05847
        validation_0-logloss:0.25574
                                         validation_0-error:0.03939
[23]
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
        validation 0-logloss:0.22341
                                         validation 0-error:0.03751
[28]
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
                                         validation_0-error:0.03751
[30]
        validation_0-logloss:0.21304
validation_1-logloss:0.22826
                                 validation_1-error:0.05247
        validation_0-logloss:0.20821
                                         validation_0-error:0.03601
[31]
validation_1-logloss:0.22356
                                 validation_1-error:0.05247
        validation_0-logloss:0.20377
                                         validation_0-error:0.03601
[32]
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-error:0.05097
validation 1-logloss:0.20891
        validation 0-logloss:0.18789
                                         validation 0-error:0.03526
[36]
validation_1-logloss:0.20633
                                 validation_1-error:0.04947
        validation 0-logloss:0.18432
                                         validation_0-error:0.03526
[37]
validation_1-logloss:0.20329
                                 validation_1-error:0.05097
        validation_0-logloss:0.18124
                                         validation_0-error:0.03451
[38]
validation_1-logloss:0.20043
                                 validation_1-error:0.04798
        validation_0-logloss:0.17839
[39]
                                         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
        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
        validation 0-logloss:0.16749
[43]
                                         validation 0-error:0.03413
validation 1-logloss:0.18880
                                 validation 1-error:0.04648
Γ441
        validation_0-logloss:0.16512
                                         validation 0-error:0.03338
validation_1-logloss:0.18697
                                 validation_1-error:0.04798
        validation_0-logloss:0.16301
[45]
                                         validation 0-error:0.03338
validation_1-logloss:0.18536
                                 validation_1-error:0.04648
        validation_0-logloss:0.16080
                                         validation_0-error:0.03301
[46]
validation_1-logloss:0.18297
                                 validation_1-error:0.04648
        validation_0-logloss:0.15868
                                         validation_0-error:0.03301
[47]
validation_1-logloss:0.18113
                                 validation_1-error:0.04648
[48]
        validation_0-logloss:0.15685
                                         validation_0-error:0.03301
validation_1-logloss:0.17999
                                 validation_1-error:0.04648
[49]
        validation_0-logloss:0.15498
                                         validation_0-error:0.03301
```

```
validation_1-logloss:0.17784
                                 validation_1-error:0.04648
[50]
        validation_0-logloss:0.15307
                                         validation_0-error:0.03263
validation_1-logloss:0.17595
                                 validation_1-error:0.04798
        validation_0-logloss:0.15141
                                         validation_0-error:0.03226
[51]
validation 1-logloss:0.17413
                                 validation 1-error:0.04798
[52]
        validation 0-logloss:0.14978
                                         validation 0-error:0.03226
validation 1-logloss:0.17289
                                 validation 1-error:0.04798
[53]
        validation_0-logloss:0.14802
                                         validation_0-error:0.03226
validation 1-logloss:0.17203
                                 validation 1-error:0.04648
[54]
        validation_0-logloss:0.14649
                                         validation_0-error:0.03226
validation_1-logloss:0.17061
                                 validation_1-error:0.04498
[55]
        validation_0-logloss:0.14507
                                         validation_0-error:0.03151
validation_1-logloss:0.16930
                                 validation_1-error:0.04648
        validation_0-logloss:0.14379
                                         validation_0-error:0.03151
[56]
validation_1-logloss:0.16799
                                 validation_1-error:0.04648
[57]
        validation_0-logloss:0.14245
                                         validation_0-error:0.03151
validation_1-logloss:0.16701
                                 validation_1-error:0.04648
[58]
        validation_0-logloss:0.14089
                                         validation_0-error:0.03113
validation_1-logloss:0.16622
                                 validation 1-error:0.04648
[59]
        validation 0-logloss:0.13969
                                         validation 0-error:0.03113
validation 1-logloss:0.16504
                                 validation 1-error:0.04648
        validation 0-logloss:0.13855
[60]
                                         validation 0-error:0.03113
validation_1-logloss:0.16402
                                 validation_1-error:0.04648
        validation_0-logloss:0.13717
                                         validation_0-error:0.03038
[61]
validation_1-logloss:0.16342
                                 validation_1-error:0.04648
[62]
        validation_0-logloss:0.13609
                                         validation_0-error:0.03076
validation_1-logloss:0.16232
                                 validation_1-error:0.04648
        validation_0-logloss:0.13487
[63]
                                         validation_0-error:0.03038
validation_1-logloss:0.16137
                                 validation 1-error:0.04648
[64]
        validation_0-logloss:0.13338
                                         validation_0-error:0.03001
validation_1-logloss:0.16022
                                 validation_1-error:0.04648
        validation_0-logloss:0.13224
[65]
                                         validation_0-error:0.03001
validation_1-logloss:0.15952
                                 validation_1-error:0.04648
[66]
        validation_0-logloss:0.13105
                                         validation_0-error:0.03001
validation 1-logloss:0.15913
                                 validation 1-error:0.04648
        validation 0-logloss:0.13029
[67]
                                         validation 0-error:0.03001
validation 1-logloss:0.15851
                                 validation 1-error:0.04498
[68]
        validation_0-logloss:0.12938
                                         validation 0-error:0.02963
validation_1-logloss:0.15738
                                 validation_1-error:0.04498
        validation_0-logloss:0.12867
[69]
                                         validation 0-error:0.02963
validation_1-logloss:0.15724
                                 validation_1-error:0.04498
[70]
        validation_0-logloss:0.12793
                                         validation_0-error:0.02888
validation_1-logloss:0.15672
                                 validation_1-error:0.04348
        validation_0-logloss:0.12676
                                         validation_0-error:0.02851
[71]
validation_1-logloss:0.15635
                                 validation_1-error:0.04348
[72]
        validation_0-logloss:0.12588
                                         validation_0-error:0.02851
validation_1-logloss:0.15553
                                 validation_1-error:0.04348
[73]
        validation_0-logloss:0.12491
                                         validation_0-error:0.02851
```

```
validation_1-logloss:0.15536
                                 validation_1-error:0.04348
[74]
        validation_0-logloss:0.12431
                                         validation_0-error:0.02851
validation_1-logloss:0.15483
                                 validation_1-error:0.04348
[75]
        validation 0-logloss:0.12370
                                         validation_0-error:0.02813
validation 1-logloss:0.15454
                                 validation 1-error:0.04348
[76]
        validation 0-logloss:0.12261
                                         validation 0-error:0.02851
validation 1-logloss:0.15429
                                 validation 1-error:0.04348
        validation 0-logloss:0.12203
[77]
                                         validation 0-error:0.02851
validation 1-logloss:0.15383
                                 validation 1-error:0.04348
        validation_0-logloss:0.12156
                                         validation_0-error:0.02851
[78]
validation_1-logloss:0.15367
                                 validation_1-error:0.04348
[79]
        validation_0-logloss:0.12080
                                         validation_0-error:0.02851
validation_1-logloss:0.15328
                                 validation_1-error:0.04348
[80]
        validation_0-logloss:0.11997
                                         validation 0-error:0.02851
validation_1-logloss:0.15349
                                 validation_1-error:0.04348
[81]
        validation_0-logloss:0.11951
                                         validation_0-error:0.02851
validation_1-logloss:0.15331
                                 validation_1-error:0.04348
[82]
        validation_0-logloss:0.11868
                                         validation_0-error:0.02851
validation 1-logloss:0.15313
                                 validation 1-error:0.04498
[83]
        validation 0-logloss:0.11826
                                         validation 0-error:0.02851
validation 1-logloss:0.15310
                                 validation 1-error:0.04348
[84]
        validation 0-logloss:0.11774
                                         validation 0-error:0.02851
validation_1-logloss:0.15288
                                 validation 1-error:0.04498
        validation_0-logloss:0.11739
                                         validation_0-error:0.02851
[85]
validation_1-logloss:0.15282
                                 validation_1-error:0.04348
[86]
        validation_0-logloss:0.11680
                                         validation_0-error:0.02851
validation_1-logloss:0.15255
                                 validation 1-error:0.04198
        validation_0-logloss:0.11589
                                         validation_0-error:0.02813
[87]
validation 1-logloss:0.15250
                                 validation 1-error:0.04198
[88]
        validation_0-logloss:0.11552
                                         validation_0-error:0.02776
validation_1-logloss:0.15267
                                 validation_1-error:0.04348
[89]
        validation_0-logloss:0.11465
                                         validation_0-error:0.02776
validation_1-logloss:0.15259
                                 validation 1-error:0.04198
                                         validation_0-error:0.02776
[90]
        validation_0-logloss:0.11386
                                 validation_1-error:0.04198
validation 1-logloss:0.15237
        validation 0-logloss:0.11354
[91]
                                         validation 0-error:0.02776
validation 1-logloss:0.15269
                                 validation 1-error:0.04348
[92]
        validation_0-logloss:0.11305
                                         validation 0-error:0.02776
validation_1-logloss:0.15253
                                 validation_1-error:0.04348
        validation_0-logloss:0.11256
                                         validation 0-error:0.02776
[93]
validation_1-logloss:0.15233
                                 validation_1-error:0.04348
        validation_0-logloss:0.11185
                                         validation_0-error:0.02776
[94]
validation_1-logloss:0.15264
                                 validation_1-error:0.04348
[95]
        validation_0-logloss:0.11101
                                         validation_0-error:0.02738
validation_1-logloss:0.15263
                                 validation_1-error:0.04498
        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)

```
validation 0-logloss:0.11027
[97]
                                         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
        validation_0-logloss:0.10825
[101]
                                         validation_0-error:0.02738
validation_1-logloss:0.15297
                                 validation_1-error:0.04348
[102]
        validation_0-logloss:0.10800
                                         validation_0-error:0.02738
validation 1-logloss:0.15305
                                 validation 1-error:0.04348
        validation_0-logloss:0.10752
                                         validation_0-error:0.02738
[103]
validation 1-logloss:0.15329
                                 validation 1-error:0.04348
        validation_0-logloss:0.10675
                                         validation_0-error:0.02738
[104]
validation 1-logloss:0.15310
                                 validation 1-error:0.04498
        validation_0-logloss:0.10633
                                         validation_0-error:0.02738
[105]
validation 1-logloss:0.15291
                                 validation 1-error:0.04498
        validation_0-logloss:0.10579
[106]
                                         validation_0-error:0.02738
validation 1-logloss:0.15323
                                 validation_1-error:0.04648
[107]
        validation_0-logloss:0.10562
                                         validation_0-error:0.02738
validation_1-logloss:0.15316
                                 validation_1-error:0.04648
[108]
        validation_0-logloss:0.10522
                                         validation_0-error:0.02738
validation_1-logloss:0.15270
                                 validation_1-error:0.04498
        validation_0-logloss:0.10485
                                         validation_0-error:0.02738
[109]
validation_1-logloss:0.15292
                                 validation_1-error:0.04498
        validation_0-logloss:0.10468
                                         validation_0-error:0.02738
validation_1-logloss:0.15294
                                 validation 1-error:0.04498
[1111]
        validation_0-logloss:0.10439
                                         validation_0-error:0.02738
validation_1-logloss:0.15306
                                 validation_1-error:0.04498
        validation_0-logloss:0.10371
                                         validation 0-error:0.02738
[112]
validation_1-logloss:0.15296
                                 validation_1-error:0.04348
        validation 0-logloss:0.10357
                                         validation 0-error:0.02738
[113]
validation_1-logloss:0.15309
                                 validation_1-error:0.04348
[114]
        validation_0-logloss:0.10326
                                         validation 0-error:0.02738
validation_1-logloss:0.15298
                                 validation_1-error:0.04348
[115]
        validation_0-logloss:0.10290
                                         validation_0-error:0.02738
validation_1-logloss:0.15318
                                 validation_1-error:0.04348
[116]
        validation_0-logloss:0.10248
                                         validation_0-error:0.02738
validation_1-logloss:0.15285
                                 validation_1-error:0.04348
        validation_0-logloss:0.10214
                                         validation_0-error:0.02738
[117]
```

```
validation_1-logloss:0.15251
                                 validation_1-error:0.04348
        validation_0-logloss:0.10193
                                         validation_0-error:0.02738
[118]
validation_1-logloss:0.15260
                                 validation_1-error:0.04348
[119]
        validation_0-logloss:0.10152
                                         validation_0-error:0.02738
validation 1-logloss:0.15263
                                 validation 1-error:0.04348
        validation_0-logloss:0.65317
                                         validation 0-error:0.04651
validation 1-logloss:0.65440
                                 validation_1-error:0.06447
[1]
        validation_0-logloss:0.61711
                                         validation 0-error:0.04614
validation 1-logloss:0.61943
                                 validation 1-error:0.06447
                                         validation_0-error:0.04651
        validation_0-logloss:0.58412
validation_1-logloss:0.58755
                                 validation_1-error:0.06447
        validation_0-logloss:0.55399
                                         validation_0-error:0.04651
[3]
validation_1-logloss:0.55831
                                 validation_1-error:0.06447
        validation_0-logloss:0.52652
                                         validation_0-error:0.04651
validation_1-logloss:0.53176
                                 validation_1-error:0.06597
        validation_0-logloss:0.50104
                                         validation_0-error:0.04539
validation_1-logloss:0.50660
                                 validation_1-error:0.06597
        validation_0-logloss:0.47778
                                         validation_0-error:0.04539
[6]
validation_1-logloss:0.48414
                                 validation 1-error:0.06597
[7]
        validation 0-logloss:0.45618
                                         validation 0-error:0.04539
validation 1-logloss:0.46339
                                 validation 1-error:0.06597
        validation 0-logloss:0.43597
[8]
                                         validation 0-error:0.04426
validation_1-logloss:0.44349
                                 validation_1-error:0.06447
        validation_0-logloss:0.41741
                                         validation 0-error:0.04389
validation_1-logloss:0.42547
                                 validation_1-error:0.06297
        validation_0-logloss:0.40010
                                         validation_0-error:0.04426
[10]
validation_1-logloss:0.40850
                                 validation_1-error:0.06147
        validation_0-logloss:0.38409
[11]
                                         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
        validation_0-logloss:0.35518
[13]
                                         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
        validation 0-logloss:0.32929
[15]
                                         validation 0-error:0.04239
validation 1-logloss:0.33942
                                 validation 1-error:0.05547
Г16<sub>]</sub>
        validation_0-logloss:0.31724
                                         validation 0-error:0.04201
validation_1-logloss:0.32752
                                 validation_1-error:0.05847
        validation_0-logloss:0.30599
[17]
                                         validation_0-error:0.04276
validation_1-logloss:0.31629
                                 validation_1-error:0.05697
        validation_0-logloss:0.29535
                                         validation_0-error:0.04239
[18]
validation_1-logloss:0.30595
                                 validation_1-error:0.05847
        validation_0-logloss:0.28548
                                         validation_0-error:0.04201
[19]
validation_1-logloss:0.29627
                                 validation_1-error:0.05547
[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
```

```
validation_1-logloss:0.27882
                                 validation_1-error:0.05097
[22]
        validation_0-logloss:0.25954
                                         validation_0-error:0.03976
validation_1-logloss:0.27074
                                 validation_1-error:0.04798
[23]
        validation_0-logloss:0.25180
                                         validation_0-error:0.03939
validation 1-logloss:0.26329
                                 validation 1-error:0.04798
        validation 0-logloss:0.24462
                                         validation 0-error:0.03901
[24]
validation 1-logloss:0.25638
                                 validation_1-error:0.04798
[25]
        validation_0-logloss:0.23778
                                         validation_0-error:0.03864
validation 1-logloss:0.24999
                                 validation 1-error:0.04798
[26]
        validation_0-logloss:0.23115
                                         validation_0-error:0.03864
validation_1-logloss:0.24381
                                 validation_1-error:0.04798
[27]
        validation_0-logloss:0.22491
                                         validation_0-error:0.03751
validation_1-logloss:0.23806
                                 validation_1-error:0.04798
        validation_0-logloss:0.21909
                                         validation_0-error:0.03751
[28]
validation_1-logloss:0.23269
                                 validation_1-error:0.04648
[29]
        validation_0-logloss:0.21357
                                         validation_0-error:0.03788
validation_1-logloss:0.22782
                                 validation_1-error:0.04798
[30]
        validation_0-logloss:0.20833
                                         validation_0-error:0.03676
validation_1-logloss:0.22304
                                 validation 1-error:0.04498
Γ317
        validation 0-logloss:0.20343
                                         validation 0-error:0.03526
validation 1-logloss:0.21838
                                 validation 1-error:0.04348
        validation 0-logloss:0.19905
[32]
                                         validation 0-error:0.03526
validation_1-logloss:0.21429
                                 validation_1-error:0.04498
        validation_0-logloss:0.19448
                                         validation_0-error:0.03488
[33]
validation_1-logloss:0.21037
                                 validation_1-error:0.04648
        validation_0-logloss:0.19029
[34]
                                         validation_0-error:0.03526
validation_1-logloss:0.20646
                                 validation_1-error:0.04498
        validation_0-logloss:0.18623
[35]
                                         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
validation_1-logloss:0.19959
                                 validation_1-error:0.04198
[37]
        validation_0-logloss:0.17870
                                         validation_0-error:0.03526
validation_1-logloss:0.19652
                                 validation_1-error:0.04198
        validation_0-logloss:0.17522
                                         validation_0-error:0.03488
[38]
validation 1-logloss:0.19355
                                 validation 1-error:0.04198
        validation 0-logloss:0.17218
[39]
                                         validation 0-error:0.03301
validation 1-logloss:0.19106
                                 validation 1-error:0.04048
Γ401
        validation_0-logloss:0.16908
                                         validation 0-error:0.03263
validation_1-logloss:0.18830
                                 validation_1-error:0.03898
        validation_0-logloss:0.16661
[41]
                                         validation_0-error:0.03226
validation_1-logloss:0.18636
                                 validation_1-error:0.04048
[42]
        validation_0-logloss:0.16396
                                         validation_0-error:0.03151
validation_1-logloss:0.18439
                                 validation_1-error:0.04048
        validation_0-logloss:0.16150
                                         validation_0-error:0.03113
[43]
validation_1-logloss:0.18274
                                 validation_1-error:0.04048
        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
validation_1-logloss:0.17822
                                 validation_1-error:0.04048
[47]
        validation_0-logloss:0.15281
                                         validation_0-error:0.03038
validation 1-logloss:0.17669
                                 validation 1-error:0.03898
        validation 0-logloss:0.15091
                                         validation 0-error:0.03038
[48]
validation 1-logloss:0.17556
                                 validation 1-error:0.03898
[49]
        validation_0-logloss:0.14908
                                         validation_0-error:0.03038
validation 1-logloss:0.17350
                                 validation 1-error:0.03898
[50]
        validation_0-logloss:0.14706
                                         validation_0-error:0.02963
validation_1-logloss:0.17262
                                 validation_1-error:0.03898
[51]
        validation_0-logloss:0.14536
                                         validation_0-error:0.02963
validation_1-logloss:0.17072
                                 validation_1-error:0.03898
        validation_0-logloss:0.14357
                                         validation_0-error:0.02851
[52]
validation_1-logloss:0.17009
                                 validation_1-error:0.03898
[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
        validation 0-logloss:0.13767
[56]
                                         validation 0-error:0.02738
validation_1-logloss:0.16431
                                 validation_1-error:0.03898
        validation 0-logloss:0.13640
                                         validation_0-error:0.02663
[57]
validation_1-logloss:0.16309
                                 validation_1-error:0.03898
        validation_0-logloss:0.13456
                                         validation_0-error:0.02663
[58]
validation_1-logloss:0.16234
                                 validation_1-error:0.04048
        validation_0-logloss:0.13337
[59]
                                         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
        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
        validation 0-logloss:0.12807
[63]
                                         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
        validation_0-logloss:0.12625
[65]
                                         validation_0-error:0.02551
validation_1-logloss:0.15607
                                 validation_1-error:0.03748
        validation_0-logloss:0.12484
                                         validation_0-error:0.02551
[66]
validation_1-logloss:0.15542
                                 validation_1-error:0.03748
        validation_0-logloss:0.12404
                                         validation_0-error:0.02551
[67]
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
             validation_0-logloss:0.12107
                                              validation_0-error:0.02551
     [70]
     validation_1-logloss:0.15343
                                      validation_1-error:0.03448
             validation 0-logloss:0.11992
                                              validation_0-error:0.02551
     [71]
     validation 1-logloss:0.15282
                                      validation 1-error:0.03448
             validation 0-logloss:0.11895
                                              validation 0-error:0.02551
     [72]
     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
             validation_0-logloss:0.11731
                                              validation_0-error:0.02551
                                     validation_1-error:0.03598
     validation_1-logloss:0.15203
     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
                     0.96
                                0.89
                                           0.92
                                                       667
   macro avg
weighted avg
                     0.96
                                0.96
                                           0.96
                                                       667
```

validation_0-logloss:0.61520

[0]

validation_0-error:0.04651

validation 1-logloss:0.61770 validation 1-error:0.06447 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 validation_0-logloss:0.45288 validation_0-error:0.04464 validation_1-logloss:0.46004 validation_1-error:0.06597 validation 0-logloss:0.41440 [4] validation 0-error:0.04351 validation_1-error:0.06297 validation_1-logloss:0.42215 validation_0-logloss:0.38126 validation 0-error:0.04276 validation_1-logloss:0.38942 validation_1-error:0.06147 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 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 validation_0-logloss:0.26508 validation_0-error:0.03976 [10] validation_1-logloss:0.27518 validation_1-error:0.04648 validation_0-logloss:0.24955 [11] 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
        validation_0-logloss:0.22290
[13]
                                         validation_0-error:0.03864
validation_1-logloss:0.23573
                                 validation 1-error:0.04498
        validation 0-logloss:0.21175
                                         validation 0-error:0.03751
Γ14]
validation 1-logloss:0.22502
                                 validation 1-error:0.04348
        validation 0-logloss:0.20170
                                         validation 0-error:0.03638
validation_1-logloss:0.21573
                                 validation 1-error:0.04498
        validation_0-logloss:0.19252
                                         validation 0-error:0.03563
[16]
validation_1-logloss:0.20809
                                 validation_1-error:0.04198
        validation_0-logloss:0.18430
[17]
                                         validation_0-error:0.03751
validation_1-logloss:0.20134
                                 validation_1-error:0.04348
        validation_0-logloss:0.17702
[18]
                                         validation_0-error:0.03601
validation_1-logloss:0.19489
                                 validation_1-error:0.04498
        validation_0-logloss:0.17091
[19]
                                         validation_0-error:0.03413
validation_1-logloss:0.18992
                                 validation_1-error:0.04198
[20]
        validation_0-logloss:0.16515
                                         validation_0-error:0.03301
validation_1-logloss:0.18521
                                 validation_1-error:0.04048
[21]
        validation_0-logloss:0.16032
                                         validation_0-error:0.03188
validation 1-logloss:0.18027
                                 validation 1-error:0.04198
        validation_0-logloss:0.15583
                                         validation 0-error:0.03076
validation 1-logloss:0.17727
                                 validation 1-error:0.03898
        validation_0-logloss:0.15186
                                         validation_0-error:0.03001
validation_1-logloss:0.17481
                                 validation_1-error:0.04048
[24]
        validation_0-logloss:0.14825
                                         validation_0-error:0.03038
validation_1-logloss:0.17077
                                 validation_1-error:0.03898
        validation_0-logloss:0.14433
                                         validation_0-error:0.02888
[25]
validation_1-logloss:0.16937
                                 validation_1-error:0.04048
        validation_0-logloss:0.14105
                                         validation_0-error:0.02813
[26]
validation_1-logloss:0.16668
                                 validation_1-error:0.04198
[27]
        validation_0-logloss:0.13821
                                         validation_0-error:0.02738
validation_1-logloss:0.16348
                                 validation_1-error:0.03898
[28]
        validation_0-logloss:0.13562
                                         validation_0-error:0.02738
validation_1-logloss:0.16059
                                 validation 1-error:0.03748
        validation 0-logloss:0.13206
                                         validation 0-error:0.02663
validation 1-logloss:0.15900
                                 validation 1-error:0.03598
        validation 0-logloss:0.12981
                                         validation 0-error:0.02626
[30]
validation_1-logloss:0.15685
                                 validation 1-error:0.03598
        validation_0-logloss:0.12796
                                         validation_0-error:0.02626
[31]
validation_1-logloss:0.15543
                                 validation 1-error:0.03448
        validation_0-logloss:0.12507
                                         validation_0-error:0.02588
[32]
validation_1-logloss:0.15415
                                 validation_1-error:0.03598
[33]
        validation_0-logloss:0.12319
                                         validation_0-error:0.02551
validation_1-logloss:0.15233
                                 validation 1-error:0.03598
        validation_0-logloss:0.12096
[34]
                                         validation_0-error:0.02551
validation_1-logloss:0.15182
                                 validation_1-error:0.03748
[35]
        validation_0-logloss:0.11896
                                         validation_0-error:0.02476
validation_1-logloss:0.15121
                                 validation_1-error:0.03748
```

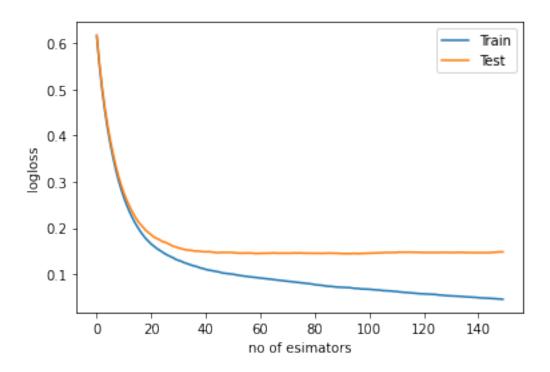
```
[36]
        validation_0-logloss:0.11746
                                         validation_0-error:0.02476
validation_1-logloss:0.15000
                                 validation_1-error:0.03598
        validation_0-logloss:0.11585
[37]
                                         validation_0-error:0.02401
validation_1-logloss:0.15011
                                 validation 1-error:0.03748
        validation 0-logloss:0.11341
                                         validation 0-error:0.02476
[38]
validation 1-logloss:0.14968
                                 validation 1-error:0.03598
        validation 0-logloss:0.11229
                                         validation 0-error:0.02438
validation_1-logloss:0.14868
                                 validation 1-error:0.03748
[40]
        validation_0-logloss:0.11029
                                         validation 0-error:0.02363
validation_1-logloss:0.14828
                                 validation_1-error:0.03448
        validation_0-logloss:0.10890
[41]
                                         validation_0-error:0.02363
validation_1-logloss:0.14891
                                 validation_1-error:0.03748
        validation_0-logloss:0.10795
[42]
                                         validation_0-error:0.02363
validation_1-logloss:0.14807
                                 validation_1-error:0.03748
        validation_0-logloss:0.10665
[43]
                                         validation_0-error:0.02363
validation_1-logloss:0.14711
                                 validation_1-error:0.03898
[44]
        validation_0-logloss:0.10561
                                         validation_0-error:0.02401
validation_1-logloss:0.14659
                                 validation_1-error:0.03748
[45]
        validation_0-logloss:0.10470
                                         validation_0-error:0.02401
validation 1-logloss:0.14667
                                 validation 1-error:0.03748
        validation_0-logloss:0.10268
                                         validation 0-error:0.02326
validation 1-logloss:0.14717
                                 validation 1-error:0.03898
[47]
        validation_0-logloss:0.10198
                                         validation_0-error:0.02326
validation 1-logloss:0.14698
                                 validation_1-error:0.03898
[48]
        validation_0-logloss:0.10112
                                         validation_0-error:0.02288
validation_1-logloss:0.14704
                                 validation_1-error:0.03898
[49]
        validation_0-logloss:0.10049
                                         validation_0-error:0.02288
validation_1-logloss:0.14715
                                 validation_1-error:0.03898
[50]
        validation_0-logloss:0.09988
                                         validation_0-error:0.02288
validation_1-logloss:0.14662
                                 validation_1-error:0.03898
[51]
        validation_0-logloss:0.09869
                                         validation_0-error:0.02288
validation_1-logloss:0.14596
                                 validation_1-error:0.03898
[52]
        validation_0-logloss:0.09760
                                         validation_0-error:0.02288
validation_1-logloss:0.14561
                                 validation 1-error:0.03898
        validation 0-logloss:0.09687
                                         validation 0-error:0.02251
validation 1-logloss:0.14554
                                 validation 1-error:0.03898
        validation 0-logloss:0.09591
                                         validation 0-error:0.02288
[54]
validation_1-logloss:0.14581
                                 validation 1-error:0.03748
        validation_0-logloss:0.09509
                                         validation_0-error:0.02288
[55]
validation_1-logloss:0.14578
                                 validation 1-error:0.03748
        validation_0-logloss:0.09440
                                         validation_0-error:0.02288
[56]
validation_1-logloss:0.14581
                                 validation_1-error:0.03748
[57]
        validation_0-logloss:0.09379
                                         validation_0-error:0.02213
validation_1-logloss:0.14569
                                 validation 1-error:0.03898
        validation_0-logloss:0.09312
[58]
                                         validation_0-error:0.02213
validation_1-logloss:0.14482
                                 validation_1-error:0.03748
[59]
        validation_0-logloss:0.09242
                                         validation_0-error:0.02213
validation_1-logloss:0.14492
                                 validation_1-error:0.03598
```

```
[60]
        validation_0-logloss:0.09151
                                         validation_0-error:0.02176
validation_1-logloss:0.14482
                                 validation_1-error:0.03748
        validation_0-logloss:0.09103
[61]
                                         validation_0-error:0.02176
validation_1-logloss:0.14515
                                 validation 1-error:0.03748
[62]
        validation 0-logloss:0.09023
                                         validation 0-error:0.02176
validation 1-logloss:0.14513
                                 validation 1-error:0.03448
        validation 0-logloss:0.08953
                                         validation 0-error:0.02138
validation_1-logloss:0.14536
                                 validation 1-error:0.03448
        validation_0-logloss:0.08908
                                         validation 0-error:0.02138
[64]
validation_1-logloss:0.14563
                                 validation_1-error:0.03448
        validation_0-logloss:0.08808
[65]
                                         validation_0-error:0.02138
validation_1-logloss:0.14613
                                 validation_1-error:0.03448
        validation_0-logloss:0.08742
[66]
                                         validation_0-error:0.02138
validation_1-logloss:0.14542
                                 validation_1-error:0.03448
        validation_0-logloss:0.08667
[67]
                                         validation_0-error:0.02138
validation_1-logloss:0.14556
                                 validation_1-error:0.03448
[68]
        validation_0-logloss:0.08623
                                         validation_0-error:0.02138
validation_1-logloss:0.14560
                                 validation_1-error:0.03448
[69]
        validation_0-logloss:0.08525
                                         validation_0-error:0.02138
validation 1-logloss:0.14539
                                 validation 1-error:0.03598
        validation_0-logloss:0.08485
                                         validation 0-error:0.02138
validation 1-logloss:0.14565
                                 validation 1-error:0.03448
[71]
        validation_0-logloss:0.08406
                                         validation_0-error:0.02100
validation 1-logloss:0.14538
                                 validation 1-error:0.03298
[72]
        validation_0-logloss:0.08320
                                         validation_0-error:0.02138
validation_1-logloss:0.14594
                                 validation_1-error:0.03448
        validation_0-logloss:0.08277
                                         validation_0-error:0.02100
[73]
validation_1-logloss:0.14574
                                 validation_1-error:0.03448
[74]
        validation_0-logloss:0.08239
                                         validation_0-error:0.02100
validation_1-logloss:0.14598
                                 validation_1-error:0.03448
[75]
        validation_0-logloss:0.08148
                                         validation_0-error:0.02025
validation_1-logloss:0.14596
                                 validation_1-error:0.03448
[76]
        validation_0-logloss:0.08091
                                         validation_0-error:0.02025
validation_1-logloss:0.14545
                                 validation 1-error:0.03598
        validation 0-logloss:0.07996
                                         validation 0-error:0.02025
validation 1-logloss:0.14540
                                 validation 1-error:0.03448
        validation 0-logloss:0.07915
                                         validation 0-error:0.02025
[78]
validation_1-logloss:0.14529
                                 validation 1-error:0.03448
        validation_0-logloss:0.07866
                                         validation_0-error:0.02025
[79]
validation_1-logloss:0.14500
                                 validation 1-error:0.03448
        validation_0-logloss:0.07731
                                         validation_0-error:0.02025
[80]
validation_1-logloss:0.14495
                                 validation_1-error:0.03448
[81]
        validation_0-logloss:0.07683
                                         validation_0-error:0.02025
validation_1-logloss:0.14492
                                 validation 1-error:0.03448
        validation_0-logloss:0.07612
[82]
                                         validation_0-error:0.02025
validation_1-logloss:0.14520
                                 validation_1-error:0.03448
[83]
        validation_0-logloss:0.07554
                                         validation_0-error:0.02025
validation_1-logloss:0.14516
                                 validation_1-error:0.03448
```

```
[84]
        validation_0-logloss:0.07446
                                         validation_0-error:0.02025
validation_1-logloss:0.14544
                                 validation_1-error:0.03448
        validation_0-logloss:0.07375
[85]
                                         validation_0-error:0.02025
validation_1-logloss:0.14561
                                 validation 1-error:0.03448
        validation 0-logloss:0.07350
                                         validation 0-error:0.02025
[86]
validation 1-logloss:0.14551
                                 validation 1-error:0.03448
        validation 0-logloss:0.07272
                                         validation 0-error:0.02025
validation_1-logloss:0.14524
                                 validation 1-error:0.03448
[88]
        validation_0-logloss:0.07213
                                         validation 0-error:0.02025
validation_1-logloss:0.14558
                                 validation_1-error:0.03448
        validation_0-logloss:0.07185
                                         validation_0-error:0.02025
[89]
validation_1-logloss:0.14508
                                 validation_1-error:0.03298
        validation_0-logloss:0.07142
[90]
                                         validation_0-error:0.02025
validation_1-logloss:0.14450
                                 validation 1-error:0.03298
        validation_0-logloss:0.07116
[91]
                                         validation_0-error:0.02025
validation_1-logloss:0.14466
                                 validation_1-error:0.03298
[92]
        validation_0-logloss:0.07095
                                         validation_0-error:0.02025
validation_1-logloss:0.14457
                                 validation_1-error:0.03298
[93]
        validation 0-logloss:0.07070
                                         validation_0-error:0.02025
validation 1-logloss:0.14432
                                 validation 1-error:0.03298
                                         validation 0-error:0.02025
        validation 0-logloss:0.06961
validation 1-logloss:0.14498
                                 validation 1-error:0.03448
[95]
        validation_0-logloss:0.06928
                                         validation_0-error:0.01988
validation_1-logloss:0.14478
                                 validation 1-error:0.03298
[96]
        validation_0-logloss:0.06886
                                         validation_0-error:0.01988
validation_1-logloss:0.14455
                                 validation_1-error:0.03148
[97]
        validation_0-logloss:0.06803
                                         validation_0-error:0.01913
validation_1-logloss:0.14478
                                 validation_1-error:0.03148
[98]
        validation_0-logloss:0.06781
                                         validation_0-error:0.01951
validation_1-logloss:0.14496
                                 validation_1-error:0.03148
[99]
        validation_0-logloss:0.06756
                                         validation_0-error:0.01951
validation_1-logloss:0.14529
                                 validation_1-error:0.03148
[100]
        validation_0-logloss:0.06734
                                         validation_0-error:0.01951
validation 1-logloss:0.14531
                                 validation 1-error:0.03148
        validation 0-logloss:0.06660
                                         validation 0-error:0.01913
[101]
validation 1-logloss:0.14567
                                 validation 1-error:0.03148
        validation 0-logloss:0.06608
                                         validation 0-error:0.01913
[102]
validation_1-logloss:0.14581
                                 validation 1-error:0.03148
[103]
        validation_0-logloss:0.06574
                                         validation_0-error:0.01876
validation_1-logloss:0.14610
                                 validation 1-error:0.03148
        validation_0-logloss:0.06541
                                         validation_0-error:0.01913
[104]
validation_1-logloss:0.14645
                                 validation_1-error:0.03298
[105]
        validation_0-logloss:0.06441
                                         validation_0-error:0.01913
validation_1-logloss:0.14661
                                 validation 1-error:0.03298
        validation_0-logloss:0.06413
[106]
                                         validation_0-error:0.01913
validation_1-logloss:0.14692
                                 validation_1-error:0.03298
[107]
        validation_0-logloss:0.06390
                                         validation_0-error:0.01913
validation_1-logloss:0.14696
                                 validation_1-error:0.03298
```

```
[108]
        validation_0-logloss:0.06354
                                         validation_0-error:0.01876
validation_1-logloss:0.14682
                                 validation_1-error:0.03298
        validation_0-logloss:0.06268
[109]
                                         validation_0-error:0.01876
validation_1-logloss:0.14701
                                 validation 1-error:0.03148
        validation 0-logloss:0.06255
                                         validation 0-error:0.01876
Γ1107
validation 1-logloss:0.14712
                                 validation 1-error:0.03148
        validation 0-logloss:0.06159
                                         validation 0-error:0.01838
validation_1-logloss:0.14770
                                 validation 1-error:0.03298
        validation_0-logloss:0.06107
                                         validation 0-error:0.01838
[112]
validation_1-logloss:0.14751
                                 validation_1-error:0.03148
        validation_0-logloss:0.06051
[113]
                                         validation_0-error:0.01838
validation_1-logloss:0.14750
                                 validation_1-error:0.03298
        validation_0-logloss:0.06026
[114]
                                         validation_0-error:0.01838
validation_1-logloss:0.14761
                                 validation_1-error:0.03298
        validation_0-logloss:0.05950
[115]
                                         validation_0-error:0.01876
validation_1-logloss:0.14766
                                 validation_1-error:0.03598
[116]
        validation_0-logloss:0.05871
                                         validation_0-error:0.01838
validation_1-logloss:0.14736
                                 validation_1-error:0.03748
[117]
        validation_0-logloss:0.05847
                                         validation_0-error:0.01801
validation 1-logloss:0.14743
                                 validation 1-error:0.03748
        validation 0-logloss:0.05807
Γ1187
                                         validation 0-error:0.01763
validation 1-logloss:0.14733
                                 validation 1-error:0.03748
Γ1197
        validation_0-logloss:0.05756
                                         validation_0-error:0.01725
validation_1-logloss:0.14698
                                 validation_1-error:0.03748
[120]
        validation_0-logloss:0.05732
                                         validation_0-error:0.01725
validation_1-logloss:0.14711
                                 validation_1-error:0.03598
        validation_0-logloss:0.05697
                                         validation_0-error:0.01688
[121]
validation_1-logloss:0.14683
                                 validation_1-error:0.03448
[122]
        validation_0-logloss:0.05667
                                         validation_0-error:0.01725
validation_1-logloss:0.14682
                                 validation_1-error:0.03598
[123]
        validation_0-logloss:0.05644
                                         validation_0-error:0.01688
validation_1-logloss:0.14681
                                 validation_1-error:0.03448
[124]
        validation_0-logloss:0.05612
                                         validation_0-error:0.01688
validation 1-logloss:0.14683
                                 validation 1-error:0.03748
        validation 0-logloss:0.05537
                                         validation 0-error:0.01688
[125]
validation 1-logloss:0.14677
                                 validation 1-error:0.03598
        validation 0-logloss:0.05460
                                         validation 0-error:0.01688
[126]
validation_1-logloss:0.14689
                                 validation 1-error:0.03448
        validation_0-logloss:0.05440
                                         validation_0-error:0.01688
[127]
validation_1-logloss:0.14702
                                 validation 1-error:0.03598
        validation_0-logloss:0.05355
                                         validation_0-error:0.01688
[128]
validation_1-logloss:0.14730
                                 validation_1-error:0.03748
[129]
        validation_0-logloss:0.05328
                                         validation_0-error:0.01688
validation_1-logloss:0.14679
                                 validation 1-error:0.03598
[130]
        validation_0-logloss:0.05303
                                         validation_0-error:0.01688
validation_1-logloss:0.14676
                                 validation_1-error:0.03598
[131]
        validation_0-logloss:0.05251
                                         validation_0-error:0.01688
validation_1-logloss:0.14682
                                 validation_1-error:0.03598
```

```
[132]
             validation_0-logloss:0.05234
                                              validation_0-error:0.01688
     validation_1-logloss:0.14701
                                      validation_1-error:0.03598
             validation_0-logloss:0.05210
                                              validation_0-error:0.01613
     [133]
     validation 1-logloss:0.14724
                                      validation 1-error:0.03898
     Γ1347
             validation 0-logloss:0.05156
                                              validation 0-error:0.01575
     validation 1-logloss:0.14696
                                      validation 1-error:0.03598
             validation 0-logloss:0.05132
                                              validation 0-error:0.01575
     validation 1-logloss:0.14663
                                      validation 1-error:0.03598
             validation_0-logloss:0.05070
                                              validation 0-error:0.01538
     [136]
     validation_1-logloss:0.14662
                                      validation_1-error:0.03598
             validation_0-logloss:0.05053
                                              validation_0-error:0.01500
     [137]
     validation_1-logloss:0.14658
                                      validation_1-error:0.03598
             validation_0-logloss:0.04998
                                              validation_0-error:0.01500
     [138]
     validation 1-logloss:0.14664
                                      validation 1-error:0.03748
             validation_0-logloss:0.04977
     [139]
                                              validation_0-error:0.01500
     validation_1-logloss:0.14642
                                      validation_1-error:0.03748
     [140]
             validation_0-logloss:0.04917
                                              validation_0-error:0.01500
     validation_1-logloss:0.14637
                                      validation_1-error:0.03598
     [141]
             validation 0-logloss:0.04853
                                              validation 0-error:0.01425
     validation 1-logloss:0.14657
                                      validation 1-error:0.03748
             validation 0-logloss:0.04837
     Γ1427
                                              validation 0-error:0.01425
     validation 1-logloss:0.14654
                                      validation 1-error:0.03598
             validation_0-logloss:0.04806
                                              validation_0-error:0.01425
     validation_1-logloss:0.14659
                                      validation 1-error:0.03448
     [144]
             validation_0-logloss:0.04781
                                              validation_0-error:0.01425
     validation_1-logloss:0.14660
                                      validation_1-error:0.03598
             validation_0-logloss:0.04736
                                              validation_0-error:0.01388
     [145]
     validation_1-logloss:0.14710
                                      validation_1-error:0.03748
     [146]
             validation_0-logloss:0.04685
                                              validation_0-error:0.01313
     validation_1-logloss:0.14754
                                      validation_1-error:0.03898
     [147]
             validation_0-logloss:0.04637
                                              validation_0-error:0.01313
     validation_1-logloss:0.14791
                                      validation_1-error:0.03898
     [148]
             validation_0-logloss:0.04581
                                              validation_0-error:0.01275
     validation 1-logloss:0.14829
                                      validation 1-error:0.04048
             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()
```



: print(classi	fication_rep	ort(y_tes	t,pred_mode	14))	
	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	