

CatBoost

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Note: This program trains CatBoost model on Microsoft malware dataset. @author Saruul Khasar

```
[1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

from sklearn.impute import SimpleImputer
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.compose import ColumnTransformer

from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from catboost import CatBoostClassifier
from sklearn.metrics import accuracy_score, roc_auc_score, roc_curve,
    ↪confusion_matrix

# limit pandas floats to two decimal points
pd.options.display.float_format = '{:,.2f}'.format

import warnings
warnings.filterwarnings('ignore')
```

1 Importing dataset

1.1 Defining data types

```
[2]: %%time
dtypes = {
    'MachineIdentifier':          'category', #0  drop
    ↪(not relevant)
    'ProductName':                'category', #1  Cat (6
    ↪unique values)
    'EngineVersion':              'category', #2  split
    ↪into multiple columns and transform into numeric (73 unique values)
    'AppVersion':                 'category', #3  split
    ↪into multiple columns and transform into numeric (111 unique values)
```

'AvSigVersion':	'category', #4 split
→into multiple columns and transform into numeric (8k unique values)	
'IsBeta':	'category', #5 drop
→(not enough variation)	
'RtpStateBitfield':	'float16', #6 numeric
'IsSxsPassiveMode':	'category', #7 Cat (2
→unique values)	
'DefaultBrowsersIdentifier':	'category', #8 drop
→(null)	
'AVProductStatesIdentifier':	'category', #9 Cat
→(28k unique values)	
'AVProductsInstalled':	'float16', #10 numeric
'AVProductsEnabled':	'float16', #11 numeric
'HasTpm':	'category', #12 Cat (2
→unique values)	
'CountryIdentifier':	'category', #13 Cat
→(224 unique values)	
'CityIdentifier':	'category', #14 Cat
→(100k unique values)	
'OrganizationIdentifier':	'category', #15 drop
→(null)	
'GeoNameIdentifier':	'category', #16 Cat
→(291 unique values)	
'LocaleEnglishNameIdentifier':	'category', #17 Cat
→(278 unique values)	
'Platform':	'category', #18 drop
→(OsVer contains Platform information)	
'Processor':	'category', #19 drop
→(almost same as Census_OSArchitecture)	
'OsVer':	'category', #20 split
→into multiple columns and transform into numeric (55 unique values)	
'OsBuild':	'category', #21 drop
→(Census_OSBuildNumber contains OsBuild information)	
'OsSuite':	'category', #22 Cat (14
→unique values)	
'OsPlatformSubRelease':	'category', #23 drop
→(Census_OSBranch contains OsPlatformSubRelease information)	
'OsBuildLab':	'category', #24 drop
→(OsBuildLab = OsBuild + Census_OSArchitecture + Census_OSBranch)	
'SkuEdition':	'category', #25 Cat (8
→unique values)	
'IsProtected':	'category', #26 Cat (2
→unique values)	
'AutoSampleOptIn':	'category', #27 drop
→(not enough variation)	

```

        'PuaMode':                                'category', #28 drop
    ↪(null)
        'SMode':                                'category', #29 Cat (2
    ↪unique values)
        'IeVerIdentifier':                       'category', #30 Cat
    ↪(295 unique values)
        'SmartScreen':                           'category', #31 drop
    ↪(null)
        'Firewall':                              'category', #32 Cat (2
    ↪unique values)
        'UacLuaenable':                           'category', #33 drop
    ↪(bad data)
        'Census_MDC2FormFactor':                  'category', #34 Cat (13
    ↪unique values)
        'Census_DeviceFamily':                   'category', #35 Cat (3
    ↪unique values)
        'Census_OEMNameIdentifier':                'category', #36 Cat (3k
    ↪unique values)
        'Census_OEMModelIdentifier':               'category', #37 Cat
    ↪(170k unique values)
        'Census_ProcessorCoreCount':              'float16', #38 numeric
        'Census_ProcessorManufacturerIdentifier': 'category', #39 Cat (7
    ↪unique values)
        'Census_ProcessorModelIdentifier':         'category', #40 Cat (3k
    ↪unique values)
        'Census_ProcessorClass':                  'category', #41 drop
    ↪(null)
        'Census_PrimaryDiskTotalCapacity':         'float32', #42 numeric
        'Census_PrimaryDiskTypeName':              'category', #43 Cat
    ↪(2-4 unique values; fix category!)
        'Census_SystemVolumeTotalCapacity':        'float32', #44 numeric
        'Census_HasOpticalDiskDrive':              'category', #45 Cat (2
    ↪unique values)
        'Census_TotalPhysicalRAM':                 'float32', #46 numeric
        'Census_ChassisTypeName':                  'category', #47
    ↪drop (almost same as Census_MDC2FormFactor)
        'Census_InternalPrimaryDiagonalDisplaySizeInInches': 'float16', #48
    ↪numeric
        'Census_InternalPrimaryDisplayResolutionHorizontal': 'float16', #49
    ↪numeric
        'Census_InternalPrimaryDisplayResolutionVertical':   'float16', #50
    ↪numeric
        'Census_PowerPlatformRoleName':            'category', #51 Cat (9
    ↪unique values; fix category!)

```

```

        'Census_InternalBatteryType':                'category', #52 drop_
    ↪(null)
        'Census_InternalBatteryNumberOfCharges':      'float32',  #53 drop_
    ↪(bad data)
        'Census_OSVersion':                          'category', #54 drop_
    ↪(Census_OSVersion = OsBuild + Census_OSBuildRevision)
        'Census_OSArchitecture':                    'category', #55 Cat (3_
    ↪unique values)
        'Census_OSBranch':                          'category', #56 Cat (30_
    ↪unique values)
        'Census_OSBuildNumber':                      'category', #57 Cat_
    ↪(161 unique values)
        'Census_OSBuildRevision':                    'category', #58 Cat_
    ↪(285 unique values)
        'Census_OSEdition':                          'category', #59 Cat (32_
    ↪unique values)
        'Census_OSSkuName':                          'category', #60 drop_
    ↪(almost same as Census_OSEdition)
        'Census_OSInstallTypeName':                  'category', #61 Cat (9_
    ↪unique values)
        'Census_OSInstallLanguageIdentifier':         'category', #62 Cat (40_
    ↪unique values)
        'Census_OSUILocaleIdentifier':                'category', #63 Cat_
    ↪(148 unique values)
        'Census_OSWUAutoUpdateOptionsName':          'category', #64 Cat (6_
    ↪unique values)
        'Census_IsPortableOperatingSystem':          'category', #65 Cat (2_
    ↪unique values)
        'Census_GenuineStateName':                    'category', #66 Cat (5_
    ↪unique values)
        'Census_ActivationChannel':                  'category', #67 Cat (6_
    ↪unique values)
        'Census_IsFlightingInternal':                 'category', #68 drop_
    ↪(null)
        'Census_IsFlightsDisabled':                  'category', #69 Cat (2_
    ↪unique values)
        'Census_FlightRing':                         'category', #70 Cat (10_
    ↪unique values)
        'Census_ThresholdOptIn':                     'category', #71 drop_
    ↪(null)
        'Census_FirmwareManufacturerIdentifier':      'category', #72 Cat_
    ↪(706 unique values)
        'Census_FirmwareVersionIdentifier':           'category', #73 Cat_
    ↪(50k unique values)

```

```

        'Census_IsSecureBootEnabled':          'category', #74 Cat (2
↪unique values)
        'Census_IsWIMBootEnabled':             'category', #75 drop
↪(null)
        'Census_IsVirtualDevice':              'category', #76 Cat (2
↪unique values)
        'Census_IsTouchEnabled':               'category', #77 Cat (2
↪unique values)
        'Census_IsPenCapable':                 'category', #78 Cat (2
↪unique values)
        'Census_IsAlwaysOnAlwaysConnectedCapable': 'category', #79 Cat (2
↪unique values)
        'Wdft_IsGamer':                        'category', #80 Cat (2
↪unique values)
        'Wdft_RegionIdentifier':               'category', #81 Cat (15
↪unique values)
        'HasDetections':                       'category'  #82 Binary
↪label
    }

```

CPU times: user 7 μ s, sys: 2 μ s, total: 9 μ s
Wall time: 11 μ s

1.2 Importing dataset

```

[3]: %%time
df = pd.read_csv('train.csv', dtype=dtypes)
columns = df.columns

```

CPU times: user 2min 39s, sys: 4.94 s, total: 2min 44s
Wall time: 2min 42s

```

[4]: print("Initial number of rows: {:,}".format(len(df)))
print("Initial number of columns: {}".format(len(df.keys())))

```

Initial number of rows: 8,397,052
Initial number of columns: 83

2 Drop and transform features

2.1 Drop features by percentage of null values

Let's drop **features/columns** with more than 20 percent of the values are Null.

```

[5]: def display_nulls():
    """
    input: NA

```

output:

This function shows percentage of null values in each column.

"""

```
null_check = df.isnull().sum() / len(df) * 100
print('Percentage of rows has null value %')
print(null_check.loc>null_check != 0].sort_values(ascending=False))
return null_check
```

```
[6]: null_check = display_nulls()
columns_null = null_check.loc>null_check > 20].index
df.drop(columns_null, axis=1, inplace=True)

print("Initial number of features:    {} \
      \nRemaining number of features: {} \
      \nNumber of columns dropped:      {}".format(83, len(df.keys()),
↪83-len(df.keys())))
initial_features = len(df.keys())
remaining_features = len(df.keys())
```

Percentage of rows has null value %	
PuaMode	99.97
Census_ProcessorClass	99.59
DefaultBrowsersIdentifier	95.14
Census_IsFlightingInternal	83.04
Census_InternalBatteryType	71.05
Census_ThresholdOptIn	63.53
Census_IsWIMBootEnabled	63.44
SmartScreen	35.61
OrganizationIdentifier	30.84
SMode	6.03
CityIdentifier	3.65
Wdft_RegionIdentifier	3.40
Wdft_IsGamer	3.40
Census_InternalBatteryNumberOfCharges	3.01
Census_FirmwareManufacturerIdentifier	2.05
Census_IsFlightsDisabled	1.80
Census_FirmwareVersionIdentifier	1.79
Census_OEMModelIdentifier	1.14
Census_OEMNameIdentifier	1.07
Firewall	1.02
Census_TotalPhysicalRAM	0.90
Census_IsAlwaysOnAlwaysConnectedCapable	0.80
Census_OSInstallLanguageIdentifier	0.67
IeVerIdentifier	0.66
Census_PrimaryDiskTotalCapacity	0.59
Census_SystemVolumeTotalCapacity	0.59

Census_InternalPrimaryDiagonalDisplaySizeInInches	0.53
Census_InternalPrimaryDisplayResolutionVertical	0.53
Census_InternalPrimaryDisplayResolutionHorizontal	0.53
Census_ProcessorModelIdentifier	0.46
...	
OsBuild	0.00
CountryIdentifier	0.00
LocaleEnglishNameIdentifier	0.00
Platform	0.00
Processor	0.00
SkueEdition	0.00
OsVer	0.00
HasDetections	0.00
AutoSampleOptIn	0.00
Census_MDC2FormFactor	0.00
Census_IsPenCapable	0.00
Census_IsTouchEnabled	0.00
Census_IsSecureBootEnabled	0.00
Census_FlightRing	0.00
Census_ActivationChannel	0.00
Census_GenuineStateName	0.00
Census_IsPortableOperatingSystem	0.00
Census_OSWUAutoUpdateOptionsName	0.00
Census_OSUILocaleIdentifier	0.00
Census_OSInstallTypeName	0.00
Census_OSSkuName	0.00
Census_OSEdition	0.00
Census_OSBuildRevision	0.00
Census_OSBuildNumber	0.00
Census_OSBranch	0.00
Census_OSArchitecture	0.00
Census_OSVersion	0.00
Census_HasOpticalDiskDrive	0.00
Census_DeviceFamily	0.00
AppVersion	0.00
Length: 80, dtype: float64	
Initial number of features:	83
Remaining number of features:	74
Number of columns dropped:	9

2.2 Drop duplicated features

- Census_OSVersion: $\text{Census_OSVersion} = \text{OsBuild} + \text{Census_OSBuildRevision}$
(10.0.17134.165 = 10.0 + 17134 + 165)
- OsBuildLab: $\text{OsBuildLab} = \text{OsBuild} + \text{Census_OSArchitecture} + \text{Census_OSBranch}$
(17134.1.amd64fre.rs4_release.180410-1804 = OsBuild + 1 + Census_OSArchitecture + Census_OSBranch + 180410-1804)
- Census_OSSkuName: almost the same as Census_OSEdition

- Processor: almost same as Census_OSArchitecture
- Platform: OsVer contains Platform information
- Census_ChassisTypeName: almost the same as Census_MDC2FormFactor
- OsBuild: Census_OSBuildNumber contains OsBuild information
- OsPlatformSubRelease: Census_OSBranch contains OsPlatformSubRelease information

```
[7]: duplicated_features = ['Census_OSVersion', 'Census_OSSkuName', 'Processor',
    ↪ 'Platform',
    'Census_ChassisTypeName', 'OsBuildLab', 'OsBuild',
    ↪ 'OsPlatformSubRelease']
for i in duplicated_features:
    if i in df.keys():
        df.drop(i, axis=1, inplace=True)

print("Initial number of features:    {} \
    \nRemaining number of features: {} \
    \nNumber of columns dropped:      {}".format(initial_features, len(df.
    ↪ keys()), initial_features-len(df.keys())))
initial_features = len(df.keys())
remaining_features = len(df.keys())
```

```
Initial number of features:    74
Remaining number of features:  66
Number of columns dropped:     8
```

2.3 Drop meaningless features

Drop features that have useless information or have potential errors (3 features)

- MachineIdentifier is just a machine ID
- UacLuaenable has strange values rather than 0, 1 values
- Census_InternalBatteryNumberOfCharges has 4294967296 value in 26% of total rows

```
[8]: meaningless_features = ['MachineIdentifier', 'UacLuaenable',
    ↪ 'Census_InternalBatteryNumberOfCharges']
df.drop(meaningless_features, axis=1, inplace=True)

print("Initial number of features:    {} \
    \nRemaining number of features: {} \
    \nNumber of columns dropped:      {}".format(initial_features, len(df.
    ↪ keys()), initial_features-len(df.keys())))
initial_features = len(df.keys())
remaining_features = len(df.keys())
```

```
Initial number of features:    66
Remaining number of features:  63
Number of columns dropped:     3
```


2.4 Fix some category values

- Census_PrimaryDiskTypeName: merged 'UNKNOWN' category to 'Unspecified'
- Census_PowerPlatformRoleName: merged 'UNKNOWN' category to 'Unspecified'

```
[9]: df['Census_PrimaryDiskTypeName'].replace('UNKNOWN', 'Unspecified', inplace=True)
df['Census_PrimaryDiskTypeName'].cat.remove_unused_categories(inplace=True)

df['Census_PowerPlatformRoleName'].replace('UNKNOWN', 'Unspecified',
→inplace=True)
df['Census_PowerPlatformRoleName'].cat.remove_unused_categories(inplace=True)
```

2.5 Split some version features into numeric features

Following features are combination of numbers that each number represent certain version of a machine parts; therefore, each number has meaning and we'll split these numbers to get broader informaton - EngineVersion - AppVersion - AvSigVersion - OsVer

```
[10]: df['EngineVersion_2'] = df['EngineVersion'].str.split('.', expand=True)[2].
→astype('float16')
df['EngineVersion_3'] = df['EngineVersion'].str.split('.', expand=True)[3].
→astype('float16')
df.drop('EngineVersion', axis=1, inplace=True)

df['AppVersion_1'] = df['AppVersion'].str.split('.', expand=True)[1].
→astype('float16')
df['AppVersion_2'] = df['AppVersion'].str.split('.', expand=True)[2].
→astype('float16')
df['AppVersion_3'] = df['AppVersion'].str.split('.', expand=True)[3].
→astype('float16')
df.drop('AppVersion', axis=1, inplace=True)

df = df.loc[df['AvSigVersion'] != '1.2&#x17;3.1144.0']
df['AvSigVersion_0'] = df['AvSigVersion'].str.split('.', expand=True)[0].
→astype('float16')
df['AvSigVersion_1'] = df['AvSigVersion'].str.split('.', expand=True)[1].
→astype('float16')
df['AvSigVersion_2'] = df['AvSigVersion'].str.split('.', expand=True)[2].
→astype('float16')
df.drop('AvSigVersion', axis=1, inplace=True)

df['OsVer_0'] = df['OsVer'].str.split('.', expand=True)[0].astype('float16')
df['OsVer_1'] = df['OsVer'].str.split('.', expand=True)[1].astype('float16')
df['OsVer_2'] = df['OsVer'].str.split('.', expand=True)[2].astype('float16')
df['OsVer_3'] = df['OsVer'].str.split('.', expand=True)[3].astype('float16')
df.drop('OsVer', axis=1, inplace=True)
```

```
[11]: print("Initial number of features:    {} \
        \nRemaining number of features: {} \
        \nNumber of columns added:        {}".format(initial_features, len(df.
        ↪keys()), len(df.keys())-initial_features))

initial_features = len(df.keys())
remaining_features = len(df.keys())
```

```
Initial number of features:    63
Remaining number of features:  71
Number of columns added:      8
```

2.6 Drop features with not enough variation

Drop categorical features if a single category takes more than 95% of rows: Not enough variation

```
[12]: columns = df.columns
columns_not_var = []

for col in columns:
    if df[col].dtypes.name == 'category' and df[col].
    ↪value_counts(normalize=True).sort_values(ascending=False).
    ↪reset_index(drop=True)[0] > 0.95:
        columns_not_var.append(col)

df.drop(columns_not_var, axis=1, inplace=True)

print("Initial number of features:    {} \
        \nRemaining number of features: {} \
        \nNumber of columns dropped:    {}".format(initial_features, len(df.
        ↪keys()), initial_features-len(df.keys()))
initial_features = len(df.keys())
remaining_features = len(df.keys())
```

```
Initial number of features:    71
Remaining number of features:  59
Number of columns dropped:    12
```

2.7 Combine minor categories

If any categorical feature's value constitute less than 1 percent of the total number of rows, combine those minor categories and name them as 'OTHER'

```
[13]: %%time
columns = df.columns
for col in columns:
    if df[col].dtypes.name == 'category':
        freq = df[col].value_counts(normalize=True).reset_index()
```

```

cats_to_combine = freq.loc[freq[col] < 0.01, 'index'].to_list()
if len(cats_to_combine) > 0:
    df[col].cat.add_categories('OTHER', inplace=True)
    # for cat in cats_to_combine:
    df[col].replace(cats_to_combine, 'OTHER', inplace=True)
    df[col].cat.remove_unused_categories(inplace=True)

```

CPU times: user 19min 19s, sys: 22.6 s, total: 19min 42s
 Wall time: 19min 6s

2.8 Drop rows if categorical features have missing values

```

[14]: types = df.dtypes
columns_cat = list(types[types == 'category'].index)
df.dropna(subset=columns_cat, inplace=True)

```

3 Feature selection

3.1 Drop HasDetections feature

‘HasDetection’ is our label feature (dependent variable).

```

[15]: label = df['HasDetections'].astype('int8')
df.drop('HasDetections', axis=1, inplace=True)

```

3.2 List of remaining features

```

[16]: for idx, col in enumerate(df.keys()):
        print('{}: {}'.format(idx+1, col))

```

1. RtpStateBitfield
2. AVProductStatesIdentifier
3. AVProductsInstalled
4. AVProductsEnabled
5. CountryIdentifier
6. CityIdentifier
7. GeoNameIdentifier
8. LocaleEnglishNameIdentifier
9. OsSuite
10. SkuEdition
11. IsProtected
12. IeVerIdentifier
13. Census_MDC2FormFactor
14. Census_OEMNameIdentifier
15. Census_OEMModelIdentifier
16. Census_ProcessorCoreCount
17. Census_ProcessorManufacturerIdentifier

18. Census_ProcessorModelIdentifier
19. Census_PrimaryDiskTotalCapacity
20. Census_PrimaryDiskTypeName
21. Census_SystemVolumeTotalCapacity
22. Census_HasOpticalDiskDrive
23. Census_TotalPhysicalRAM
24. Census_InternalPrimaryDiagonalDisplaySizeInInches
25. Census_InternalPrimaryDisplayResolutionHorizontal
26. Census_InternalPrimaryDisplayResolutionVertical
27. Census_PowerPlatformRoleName
28. Census_OSArchitecture
29. Census_OSBranch
30. Census_OSBuildNumber
31. Census_OSBuildRevision
32. Census_OSEdition
33. Census_OSInstallTypeName
34. Census_OSInstallLanguageIdentifier
35. Census_OSUILocaleIdentifier
36. Census_OSWUAutoUpdateOptionsName
37. Census_GenuineStateName
38. Census_ActivationChannel
39. Census_FlightRing
40. Census_FirmwareManufacturerIdentifier
41. Census_FirmwareVersionIdentifier
42. Census_IsSecureBootEnabled
43. Census_IsTouchEnabled
44. Census_IsAlwaysOnAlwaysConnectedCapable
45. Wdft_IsGamer
46. Wdft_RegionIdentifier
47. EngineVersion_2
48. EngineVersion_3
49. AppVersion_1
50. AppVersion_2
51. AppVersion_3
52. AvSigVersion_0
53. AvSigVersion_1
54. AvSigVersion_2
55. OsVer_0
56. OsVer_1
57. OsVer_2
58. OsVer_3

3.3 Three groups of features

```
[17]: settings_list = [  
    'IsBeta', 'RtpStateBitfield', 'IsSxsPassiveMode', 'AVProductsInstalled',  
    'AVProductsEnabled', 'HasTpm', 'LocaleEnglishNameIdentifier', 'Platform',
```

```

    'OsVer','OsBuild','OsSuite','OsPlatformSubRelease',
    'OsBuildLab','SkuEdition','IsProtected','AutoSampleOptIn',
    'PuaMode','SMode','IeVerIdentifier','SmartScreen',
    □
    ↳'Firewall','UacLuaenable','Census_MDC2FormFactor','Census_OEMNameIdentifier','Census_OEMMod
    'Census_PrimaryDiskTotalCapacity','Census_PrimaryDiskTypeName',□
    ↳'Census_HasOpticalDiskDrive',
    □
    ↳'Census_PowerPlatformRoleName','Census_OSVersion','Census_OSArchitecture','Census_OSBranch'
    □
    ↳'Census_OSBuildNumber','Census_OSBuildRevision','Census_OSEdition','Census_OSSkuName','Cens
    □
    ↳'Census_OSInstallLanguageIdentifier','Census_OSUILocaleIdentifier','Census_OSWUAutoUpdateOp
    □
    ↳'Census_IsPortableOperatingSystem','Census_GenuineStateName','Census_IsFlightingInternal',
    □
    ↳'Census_IsFlightsDisabled','Census_FlightRing','Census_ThresholdOptIn','Census_IsSecureBoot
    □
    ↳'Census_IsWIMBootEnabled','Census_IsVirtualDevice','Census_IsTouchEnabled','Census_IsPenCap
    'Census_IsAlwaysOnAlwaysConnectedCapable','Wdft_IsGamer']

```

```

[18]: # We will train the model on four sets of features
      # Let's create a dataframe for each group of features
      """
      1. All features
      2. All settings
      3. All features except settings
      """

df_all = df

settings = []
for i in df.keys():
    if i in settings_list:
        settings.append(i)
df_settings = df.loc[:,(settings)]

notsettings = []
for i in df.keys():
    if i not in settings_list:
        notsettings.append(i)
df_notsettings = df.loc[:,(notsettings)]

```

4 Training the dataset on CatBoost model

4.0.1 Model 1: CatBoost on all features

```
[19]: %%time

df_cat = df_all
# Splitting features into test and train sets
X_train, X_test, y_train, y_test = train_test_split(df_cat, np.array(label),
    ↪test_size=0.3, random_state=42)

print('Train X: {}'.format(X_train.shape))
print('Test X: {}'.format(X_test.shape))
print('Train y: {}'.format(y_train.shape))
print('Test y: {}'.format(y_test.shape))

# Get categorical columns
columns = df_cat.columns
types = df_cat.dtypes
columns_cat = list(types[types == 'category'].index)
columns_cat_idx = [idx for idx, col in enumerate(columns) if col in columns_cat]

# Train the model
cat_boost = CatBoostClassifier(custom_metric='AUC')
cat_boost.fit(X_train, y_train, columns_cat_idx)
```

Train X: (5224247, 58)

Test X: (2238963, 58)

Train y: (5224247,)

Test y: (2238963,)

Learning rate set to 0.398593

0:	learn: 0.6759442	total: 7.02s	remaining: 1h 56m 52s
1:	learn: 0.6677295	total: 13.3s	remaining: 1h 51m 1s
2:	learn: 0.6638383	total: 19.2s	remaining: 1h 46m 30s
3:	learn: 0.6613658	total: 25.5s	remaining: 1h 45m 48s
4:	learn: 0.6589390	total: 31.8s	remaining: 1h 45m 33s
5:	learn: 0.6570357	total: 38.8s	remaining: 1h 47m
6:	learn: 0.6557182	total: 45.3s	remaining: 1h 47m 3s
7:	learn: 0.6545559	total: 51.3s	remaining: 1h 45m 56s
8:	learn: 0.6537700	total: 57.5s	remaining: 1h 45m 30s
9:	learn: 0.6530655	total: 1m 4s	remaining: 1h 46m 10s
10:	learn: 0.6522421	total: 1m 10s	remaining: 1h 45m 30s
11:	learn: 0.6515476	total: 1m 16s	remaining: 1h 45m 22s
12:	learn: 0.6506873	total: 1m 23s	remaining: 1h 45m 29s
13:	learn: 0.6501894	total: 1m 29s	remaining: 1h 45m 13s
14:	learn: 0.6496660	total: 1m 35s	remaining: 1h 44m 37s
15:	learn: 0.6492213	total: 1m 42s	remaining: 1h 44m 57s
16:	learn: 0.6488518	total: 1m 48s	remaining: 1h 44m 36s

17:	learn: 0.6484032	total: 1m 54s	remaining: 1h 44m 32s
18:	learn: 0.6479627	total: 2m 1s	remaining: 1h 44m 30s
19:	learn: 0.6475005	total: 2m 7s	remaining: 1h 44m 22s
20:	learn: 0.6470077	total: 2m 13s	remaining: 1h 44m 5s
21:	learn: 0.6465664	total: 2m 20s	remaining: 1h 43m 57s
22:	learn: 0.6463029	total: 2m 26s	remaining: 1h 43m 38s
23:	learn: 0.6460797	total: 2m 32s	remaining: 1h 43m 20s
24:	learn: 0.6457289	total: 2m 39s	remaining: 1h 43m 21s
25:	learn: 0.6454631	total: 2m 45s	remaining: 1h 43m 16s
26:	learn: 0.6452922	total: 2m 51s	remaining: 1h 43m 6s
27:	learn: 0.6449788	total: 2m 57s	remaining: 1h 42m 49s
28:	learn: 0.6447384	total: 3m 4s	remaining: 1h 42m 53s
29:	learn: 0.6444473	total: 3m 10s	remaining: 1h 42m 47s
30:	learn: 0.6442435	total: 3m 16s	remaining: 1h 42m 37s
31:	learn: 0.6440049	total: 3m 22s	remaining: 1h 42m 19s
32:	learn: 0.6438278	total: 3m 28s	remaining: 1h 41m 44s
33:	learn: 0.6434833	total: 3m 34s	remaining: 1h 41m 31s
34:	learn: 0.6432487	total: 3m 41s	remaining: 1h 41m 45s
35:	learn: 0.6430209	total: 3m 48s	remaining: 1h 42m 10s
36:	learn: 0.6428682	total: 3m 55s	remaining: 1h 42m 18s
37:	learn: 0.6426554	total: 4m 2s	remaining: 1h 42m 14s
38:	learn: 0.6424625	total: 4m 8s	remaining: 1h 42m 2s
39:	learn: 0.6421192	total: 4m 14s	remaining: 1h 41m 48s
40:	learn: 0.6418203	total: 4m 21s	remaining: 1h 41m 53s
41:	learn: 0.6416639	total: 4m 28s	remaining: 1h 41m 57s
42:	learn: 0.6415026	total: 4m 34s	remaining: 1h 41m 54s
43:	learn: 0.6413400	total: 4m 41s	remaining: 1h 41m 46s
44:	learn: 0.6411901	total: 4m 47s	remaining: 1h 41m 39s
45:	learn: 0.6410552	total: 4m 53s	remaining: 1h 41m 17s
46:	learn: 0.6409002	total: 4m 59s	remaining: 1h 41m 18s
47:	learn: 0.6407005	total: 5m 6s	remaining: 1h 41m 15s
48:	learn: 0.6404982	total: 5m 12s	remaining: 1h 41m 10s
49:	learn: 0.6403693	total: 5m 19s	remaining: 1h 41m 18s
50:	learn: 0.6402415	total: 5m 27s	remaining: 1h 41m 40s
51:	learn: 0.6401325	total: 5m 35s	remaining: 1h 41m 59s
52:	learn: 0.6400068	total: 5m 43s	remaining: 1h 42m 23s
53:	learn: 0.6398689	total: 5m 52s	remaining: 1h 43m
54:	learn: 0.6397578	total: 6m	remaining: 1h 43m 15s
55:	learn: 0.6396120	total: 6m 7s	remaining: 1h 43m 17s
56:	learn: 0.6395388	total: 6m 14s	remaining: 1h 43m 8s
57:	learn: 0.6394131	total: 6m 19s	remaining: 1h 42m 47s
58:	learn: 0.6392704	total: 6m 26s	remaining: 1h 42m 38s
59:	learn: 0.6391560	total: 6m 32s	remaining: 1h 42m 28s
60:	learn: 0.6390555	total: 6m 39s	remaining: 1h 42m 25s
61:	learn: 0.6389551	total: 6m 46s	remaining: 1h 42m 28s
62:	learn: 0.6387764	total: 6m 53s	remaining: 1h 42m 33s
63:	learn: 0.6386323	total: 7m	remaining: 1h 42m 31s
64:	learn: 0.6385220	total: 7m 8s	remaining: 1h 42m 41s

65:	learn: 0.6383640	total: 7m 16s	remaining: 1h 43m 1s
66:	learn: 0.6382699	total: 7m 24s	remaining: 1h 43m 3s
67:	learn: 0.6381627	total: 7m 30s	remaining: 1h 42m 53s
68:	learn: 0.6380746	total: 7m 36s	remaining: 1h 42m 45s
69:	learn: 0.6379514	total: 7m 43s	remaining: 1h 42m 35s
70:	learn: 0.6378449	total: 7m 49s	remaining: 1h 42m 22s
71:	learn: 0.6377593	total: 7m 56s	remaining: 1h 42m 20s
72:	learn: 0.6376791	total: 8m 3s	remaining: 1h 42m 21s
73:	learn: 0.6375983	total: 8m 10s	remaining: 1h 42m 13s
74:	learn: 0.6375356	total: 8m 16s	remaining: 1h 42m
75:	learn: 0.6374849	total: 8m 22s	remaining: 1h 41m 53s
76:	learn: 0.6373439	total: 8m 30s	remaining: 1h 41m 54s
77:	learn: 0.6372948	total: 8m 36s	remaining: 1h 41m 47s
78:	learn: 0.6371932	total: 8m 43s	remaining: 1h 41m 42s
79:	learn: 0.6371025	total: 8m 49s	remaining: 1h 41m 27s
80:	learn: 0.6370204	total: 8m 55s	remaining: 1h 41m 17s
81:	learn: 0.6369318	total: 9m	remaining: 1h 40m 54s
82:	learn: 0.6368466	total: 9m 7s	remaining: 1h 40m 45s
83:	learn: 0.6367951	total: 9m 13s	remaining: 1h 40m 35s
84:	learn: 0.6367148	total: 9m 19s	remaining: 1h 40m 26s
85:	learn: 0.6366596	total: 9m 26s	remaining: 1h 40m 21s
86:	learn: 0.6365821	total: 9m 34s	remaining: 1h 40m 32s
87:	learn: 0.6365090	total: 9m 42s	remaining: 1h 40m 34s
88:	learn: 0.6364565	total: 9m 49s	remaining: 1h 40m 36s
89:	learn: 0.6363753	total: 9m 57s	remaining: 1h 40m 41s
90:	learn: 0.6362499	total: 10m 4s	remaining: 1h 40m 41s
91:	learn: 0.6361524	total: 10m 11s	remaining: 1h 40m 32s
92:	learn: 0.6360886	total: 10m 18s	remaining: 1h 40m 30s
93:	learn: 0.6360210	total: 10m 25s	remaining: 1h 40m 29s
94:	learn: 0.6359512	total: 10m 33s	remaining: 1h 40m 30s
95:	learn: 0.6358674	total: 10m 40s	remaining: 1h 40m 27s
96:	learn: 0.6358153	total: 10m 47s	remaining: 1h 40m 29s
97:	learn: 0.6357050	total: 10m 55s	remaining: 1h 40m 29s
98:	learn: 0.6356596	total: 11m 2s	remaining: 1h 40m 30s
99:	learn: 0.6355987	total: 11m 9s	remaining: 1h 40m 28s
100:	learn: 0.6355161	total: 11m 16s	remaining: 1h 40m 25s
101:	learn: 0.6354288	total: 11m 23s	remaining: 1h 40m 14s
102:	learn: 0.6353873	total: 11m 29s	remaining: 1h 40m 4s
103:	learn: 0.6353515	total: 11m 35s	remaining: 1h 39m 53s
104:	learn: 0.6353012	total: 11m 41s	remaining: 1h 39m 42s
105:	learn: 0.6352494	total: 11m 48s	remaining: 1h 39m 33s
106:	learn: 0.6351340	total: 11m 54s	remaining: 1h 39m 22s
107:	learn: 0.6350457	total: 12m	remaining: 1h 39m 12s
108:	learn: 0.6349424	total: 12m 7s	remaining: 1h 39m 5s
109:	learn: 0.6348627	total: 12m 14s	remaining: 1h 39m 2s
110:	learn: 0.6348018	total: 12m 21s	remaining: 1h 38m 54s
111:	learn: 0.6347631	total: 12m 26s	remaining: 1h 38m 41s
112:	learn: 0.6346913	total: 12m 33s	remaining: 1h 38m 31s

113:	learn: 0.6346477	total: 12m 40s	remaining: 1h 38m 27s
114:	learn: 0.6345970	total: 12m 46s	remaining: 1h 38m 19s
115:	learn: 0.6345364	total: 12m 52s	remaining: 1h 38m 9s
116:	learn: 0.6344838	total: 12m 59s	remaining: 1h 38m 1s
117:	learn: 0.6344408	total: 13m 5s	remaining: 1h 37m 53s
118:	learn: 0.6343947	total: 13m 11s	remaining: 1h 37m 42s
119:	learn: 0.6343509	total: 13m 18s	remaining: 1h 37m 35s
120:	learn: 0.6343100	total: 13m 24s	remaining: 1h 37m 24s
121:	learn: 0.6342735	total: 13m 31s	remaining: 1h 37m 18s
122:	learn: 0.6342177	total: 13m 37s	remaining: 1h 37m 10s
123:	learn: 0.6341751	total: 13m 44s	remaining: 1h 37m 4s
124:	learn: 0.6341420	total: 13m 50s	remaining: 1h 36m 56s
125:	learn: 0.6340786	total: 13m 56s	remaining: 1h 36m 43s
126:	learn: 0.6340523	total: 14m 3s	remaining: 1h 36m 36s
127:	learn: 0.6339709	total: 14m 10s	remaining: 1h 36m 30s
128:	learn: 0.6339208	total: 14m 16s	remaining: 1h 36m 22s
129:	learn: 0.6338603	total: 14m 23s	remaining: 1h 36m 17s
130:	learn: 0.6338101	total: 14m 29s	remaining: 1h 36m 4s
131:	learn: 0.6337856	total: 14m 35s	remaining: 1h 35m 57s
132:	learn: 0.6337476	total: 14m 42s	remaining: 1h 35m 52s
133:	learn: 0.6337150	total: 14m 49s	remaining: 1h 35m 46s
134:	learn: 0.6336668	total: 14m 55s	remaining: 1h 35m 38s
135:	learn: 0.6336333	total: 15m 2s	remaining: 1h 35m 30s
136:	learn: 0.6335862	total: 15m 7s	remaining: 1h 35m 18s
137:	learn: 0.6335372	total: 15m 14s	remaining: 1h 35m 11s
138:	learn: 0.6334854	total: 15m 21s	remaining: 1h 35m 6s
139:	learn: 0.6334313	total: 15m 27s	remaining: 1h 35m
140:	learn: 0.6333850	total: 15m 34s	remaining: 1h 34m 54s
141:	learn: 0.6333257	total: 15m 41s	remaining: 1h 34m 46s
142:	learn: 0.6332731	total: 15m 46s	remaining: 1h 34m 34s
143:	learn: 0.6332258	total: 15m 53s	remaining: 1h 34m 27s
144:	learn: 0.6331889	total: 15m 59s	remaining: 1h 34m 19s
145:	learn: 0.6331582	total: 16m 6s	remaining: 1h 34m 12s
146:	learn: 0.6331312	total: 16m 12s	remaining: 1h 34m 4s
147:	learn: 0.6331002	total: 16m 18s	remaining: 1h 33m 55s
148:	learn: 0.6330805	total: 16m 25s	remaining: 1h 33m 47s
149:	learn: 0.6330457	total: 16m 31s	remaining: 1h 33m 40s
150:	learn: 0.6329814	total: 16m 38s	remaining: 1h 33m 35s
151:	learn: 0.6329496	total: 16m 44s	remaining: 1h 33m 26s
152:	learn: 0.6328973	total: 16m 52s	remaining: 1h 33m 22s
153:	learn: 0.6328615	total: 16m 58s	remaining: 1h 33m 14s
154:	learn: 0.6328099	total: 17m 5s	remaining: 1h 33m 9s
155:	learn: 0.6327662	total: 17m 11s	remaining: 1h 33m 2s
156:	learn: 0.6327295	total: 17m 18s	remaining: 1h 32m 57s
157:	learn: 0.6326930	total: 17m 24s	remaining: 1h 32m 48s
158:	learn: 0.6326489	total: 17m 31s	remaining: 1h 32m 41s
159:	learn: 0.6326120	total: 17m 37s	remaining: 1h 32m 31s
160:	learn: 0.6325672	total: 17m 44s	remaining: 1h 32m 25s

161:	learn: 0.6325338	total: 17m 50s	remaining: 1h 32m 15s
162:	learn: 0.6325080	total: 17m 56s	remaining: 1h 32m 5s
163:	learn: 0.6324642	total: 18m 2s	remaining: 1h 31m 58s
164:	learn: 0.6324261	total: 18m 9s	remaining: 1h 31m 52s
165:	learn: 0.6323896	total: 18m 16s	remaining: 1h 31m 47s
166:	learn: 0.6323422	total: 18m 22s	remaining: 1h 31m 40s
167:	learn: 0.6323090	total: 18m 28s	remaining: 1h 31m 31s
168:	learn: 0.6322797	total: 18m 34s	remaining: 1h 31m 21s
169:	learn: 0.6322364	total: 18m 40s	remaining: 1h 31m 12s
170:	learn: 0.6322077	total: 18m 47s	remaining: 1h 31m 4s
171:	learn: 0.6321913	total: 18m 53s	remaining: 1h 30m 57s
172:	learn: 0.6321382	total: 18m 59s	remaining: 1h 30m 49s
173:	learn: 0.6321085	total: 19m 6s	remaining: 1h 30m 40s
174:	learn: 0.6320716	total: 19m 12s	remaining: 1h 30m 32s
175:	learn: 0.6320454	total: 19m 18s	remaining: 1h 30m 21s
176:	learn: 0.6320229	total: 19m 24s	remaining: 1h 30m 15s
177:	learn: 0.6319957	total: 19m 30s	remaining: 1h 30m 7s
178:	learn: 0.6319558	total: 19m 36s	remaining: 1h 29m 58s
179:	learn: 0.6319143	total: 19m 43s	remaining: 1h 29m 49s
180:	learn: 0.6318772	total: 19m 49s	remaining: 1h 29m 42s
181:	learn: 0.6318478	total: 19m 55s	remaining: 1h 29m 34s
182:	learn: 0.6318177	total: 20m 2s	remaining: 1h 29m 28s
183:	learn: 0.6317778	total: 20m 8s	remaining: 1h 29m 20s
184:	learn: 0.6317510	total: 20m 15s	remaining: 1h 29m 13s
185:	learn: 0.6317247	total: 20m 21s	remaining: 1h 29m 4s
186:	learn: 0.6317064	total: 20m 27s	remaining: 1h 28m 57s
187:	learn: 0.6316709	total: 20m 34s	remaining: 1h 28m 51s
188:	learn: 0.6316530	total: 20m 41s	remaining: 1h 28m 46s
189:	learn: 0.6316190	total: 20m 48s	remaining: 1h 28m 40s
190:	learn: 0.6315898	total: 20m 54s	remaining: 1h 28m 32s
191:	learn: 0.6315554	total: 21m	remaining: 1h 28m 25s
192:	learn: 0.6315217	total: 21m 7s	remaining: 1h 28m 18s
193:	learn: 0.6315072	total: 21m 12s	remaining: 1h 28m 6s
194:	learn: 0.6314887	total: 21m 18s	remaining: 1h 27m 58s
195:	learn: 0.6314616	total: 21m 24s	remaining: 1h 27m 50s
196:	learn: 0.6314311	total: 21m 31s	remaining: 1h 27m 42s
197:	learn: 0.6313969	total: 21m 37s	remaining: 1h 27m 36s
198:	learn: 0.6313678	total: 21m 44s	remaining: 1h 27m 29s
199:	learn: 0.6313367	total: 21m 50s	remaining: 1h 27m 23s
200:	learn: 0.6313039	total: 21m 57s	remaining: 1h 27m 16s
201:	learn: 0.6312839	total: 22m 3s	remaining: 1h 27m 9s
202:	learn: 0.6312551	total: 22m 10s	remaining: 1h 27m 2s
203:	learn: 0.6312308	total: 22m 15s	remaining: 1h 26m 52s
204:	learn: 0.6312079	total: 22m 22s	remaining: 1h 26m 45s
205:	learn: 0.6311753	total: 22m 29s	remaining: 1h 26m 41s
206:	learn: 0.6311578	total: 22m 35s	remaining: 1h 26m 31s
207:	learn: 0.6311414	total: 22m 41s	remaining: 1h 26m 25s
208:	learn: 0.6311113	total: 22m 47s	remaining: 1h 26m 15s

209:	learn: 0.6310889	total: 22m 53s	remaining: 1h 26m 7s
210:	learn: 0.6310746	total: 23m	remaining: 1h 26m 1s
211:	learn: 0.6310520	total: 23m 7s	remaining: 1h 25m 55s
212:	learn: 0.6310347	total: 23m 13s	remaining: 1h 25m 47s
213:	learn: 0.6309888	total: 23m 19s	remaining: 1h 25m 39s
214:	learn: 0.6309628	total: 23m 24s	remaining: 1h 25m 29s
215:	learn: 0.6309408	total: 23m 31s	remaining: 1h 25m 21s
216:	learn: 0.6309219	total: 23m 37s	remaining: 1h 25m 15s
217:	learn: 0.6308802	total: 23m 44s	remaining: 1h 25m 8s
218:	learn: 0.6308414	total: 23m 50s	remaining: 1h 25m 2s
219:	learn: 0.6308240	total: 23m 57s	remaining: 1h 24m 55s
220:	learn: 0.6307905	total: 24m 3s	remaining: 1h 24m 48s
221:	learn: 0.6307733	total: 24m 10s	remaining: 1h 24m 41s
222:	learn: 0.6307420	total: 24m 16s	remaining: 1h 24m 33s
223:	learn: 0.6307195	total: 24m 22s	remaining: 1h 24m 25s
224:	learn: 0.6307020	total: 24m 28s	remaining: 1h 24m 18s
225:	learn: 0.6306855	total: 24m 35s	remaining: 1h 24m 11s
226:	learn: 0.6306552	total: 24m 41s	remaining: 1h 24m 5s
227:	learn: 0.6306409	total: 24m 47s	remaining: 1h 23m 57s
228:	learn: 0.6306168	total: 24m 54s	remaining: 1h 23m 50s
229:	learn: 0.6305827	total: 25m	remaining: 1h 23m 43s
230:	learn: 0.6305582	total: 25m 7s	remaining: 1h 23m 37s
231:	learn: 0.6305261	total: 25m 13s	remaining: 1h 23m 30s
232:	learn: 0.6305121	total: 25m 20s	remaining: 1h 23m 23s
233:	learn: 0.6304854	total: 25m 26s	remaining: 1h 23m 17s
234:	learn: 0.6304709	total: 25m 33s	remaining: 1h 23m 11s
235:	learn: 0.6304575	total: 25m 39s	remaining: 1h 23m 4s
236:	learn: 0.6304366	total: 25m 46s	remaining: 1h 23m
237:	learn: 0.6304129	total: 25m 52s	remaining: 1h 22m 51s
238:	learn: 0.6303965	total: 25m 59s	remaining: 1h 22m 44s
239:	learn: 0.6303784	total: 26m 6s	remaining: 1h 22m 39s
240:	learn: 0.6303621	total: 26m 12s	remaining: 1h 22m 31s
241:	learn: 0.6303357	total: 26m 18s	remaining: 1h 22m 23s
242:	learn: 0.6302975	total: 26m 24s	remaining: 1h 22m 14s
243:	learn: 0.6302842	total: 26m 30s	remaining: 1h 22m 7s
244:	learn: 0.6302647	total: 26m 37s	remaining: 1h 22m 1s
245:	learn: 0.6302545	total: 26m 43s	remaining: 1h 21m 53s
246:	learn: 0.6302390	total: 26m 49s	remaining: 1h 21m 46s
247:	learn: 0.6302272	total: 26m 55s	remaining: 1h 21m 37s
248:	learn: 0.6302059	total: 27m 1s	remaining: 1h 21m 30s
249:	learn: 0.6301865	total: 27m 8s	remaining: 1h 21m 24s
250:	learn: 0.6301687	total: 27m 14s	remaining: 1h 21m 16s
251:	learn: 0.6301488	total: 27m 19s	remaining: 1h 21m 7s
252:	learn: 0.6301376	total: 27m 26s	remaining: 1h 21m 1s
253:	learn: 0.6301120	total: 27m 33s	remaining: 1h 20m 57s
254:	learn: 0.6300809	total: 27m 41s	remaining: 1h 20m 52s
255:	learn: 0.6300612	total: 27m 47s	remaining: 1h 20m 45s
256:	learn: 0.6300454	total: 27m 54s	remaining: 1h 20m 41s

257:	learn: 0.6300172	total: 28m	remaining: 1h 20m 34s
258:	learn: 0.6299853	total: 28m 7s	remaining: 1h 20m 26s
259:	learn: 0.6299721	total: 28m 14s	remaining: 1h 20m 21s
260:	learn: 0.6299499	total: 28m 20s	remaining: 1h 20m 13s
261:	learn: 0.6299242	total: 28m 26s	remaining: 1h 20m 5s
262:	learn: 0.6299031	total: 28m 32s	remaining: 1h 19m 58s
263:	learn: 0.6298849	total: 28m 38s	remaining: 1h 19m 51s
264:	learn: 0.6298586	total: 28m 44s	remaining: 1h 19m 43s
265:	learn: 0.6298365	total: 28m 51s	remaining: 1h 19m 36s
266:	learn: 0.6298215	total: 28m 56s	remaining: 1h 19m 27s
267:	learn: 0.6297911	total: 29m 1s	remaining: 1h 19m 15s
268:	learn: 0.6297670	total: 29m 7s	remaining: 1h 19m 8s
269:	learn: 0.6297477	total: 29m 12s	remaining: 1h 18m 58s
270:	learn: 0.6297192	total: 29m 18s	remaining: 1h 18m 50s
271:	learn: 0.6297001	total: 29m 24s	remaining: 1h 18m 43s
272:	learn: 0.6296784	total: 29m 31s	remaining: 1h 18m 38s
273:	learn: 0.6296549	total: 29m 38s	remaining: 1h 18m 32s
274:	learn: 0.6296261	total: 29m 45s	remaining: 1h 18m 26s
275:	learn: 0.6296072	total: 29m 51s	remaining: 1h 18m 19s
276:	learn: 0.6295837	total: 29m 58s	remaining: 1h 18m 15s
277:	learn: 0.6295629	total: 30m 5s	remaining: 1h 18m 10s
278:	learn: 0.6295473	total: 30m 14s	remaining: 1h 18m 8s
279:	learn: 0.6295396	total: 30m 21s	remaining: 1h 18m 3s
280:	learn: 0.6295245	total: 30m 28s	remaining: 1h 17m 57s
281:	learn: 0.6295130	total: 30m 34s	remaining: 1h 17m 50s
282:	learn: 0.6295019	total: 30m 41s	remaining: 1h 17m 44s
283:	learn: 0.6294896	total: 30m 47s	remaining: 1h 17m 38s
284:	learn: 0.6294810	total: 30m 53s	remaining: 1h 17m 31s
285:	learn: 0.6294660	total: 31m	remaining: 1h 17m 24s
286:	learn: 0.6294539	total: 31m 7s	remaining: 1h 17m 19s
287:	learn: 0.6294294	total: 31m 13s	remaining: 1h 17m 12s
288:	learn: 0.6294153	total: 31m 19s	remaining: 1h 17m 4s
289:	learn: 0.6293871	total: 31m 25s	remaining: 1h 16m 55s
290:	learn: 0.6293717	total: 31m 31s	remaining: 1h 16m 49s
291:	learn: 0.6293476	total: 31m 38s	remaining: 1h 16m 42s
292:	learn: 0.6293351	total: 31m 44s	remaining: 1h 16m 35s
293:	learn: 0.6293171	total: 31m 50s	remaining: 1h 16m 28s
294:	learn: 0.6292963	total: 31m 56s	remaining: 1h 16m 19s
295:	learn: 0.6292730	total: 32m 2s	remaining: 1h 16m 12s
296:	learn: 0.6292562	total: 32m 8s	remaining: 1h 16m 5s
297:	learn: 0.6292300	total: 32m 15s	remaining: 1h 15m 58s
298:	learn: 0.6292155	total: 32m 20s	remaining: 1h 15m 50s
299:	learn: 0.6292029	total: 32m 26s	remaining: 1h 15m 42s
300:	learn: 0.6291910	total: 32m 33s	remaining: 1h 15m 35s
301:	learn: 0.6291637	total: 32m 39s	remaining: 1h 15m 29s
302:	learn: 0.6291428	total: 32m 46s	remaining: 1h 15m 22s
303:	learn: 0.6291127	total: 32m 52s	remaining: 1h 15m 14s
304:	learn: 0.6290949	total: 32m 58s	remaining: 1h 15m 8s

305:	learn: 0.6290759	total: 33m 5s	remaining: 1h 15m 2s
306:	learn: 0.6290615	total: 33m 11s	remaining: 1h 14m 55s
307:	learn: 0.6290481	total: 33m 18s	remaining: 1h 14m 49s
308:	learn: 0.6290245	total: 33m 23s	remaining: 1h 14m 41s
309:	learn: 0.6289936	total: 33m 30s	remaining: 1h 14m 35s
310:	learn: 0.6289834	total: 33m 36s	remaining: 1h 14m 27s
311:	learn: 0.6289693	total: 33m 43s	remaining: 1h 14m 21s
312:	learn: 0.6289507	total: 33m 49s	remaining: 1h 14m 13s
313:	learn: 0.6289248	total: 33m 55s	remaining: 1h 14m 6s
314:	learn: 0.6289013	total: 34m 1s	remaining: 1h 14m
315:	learn: 0.6288895	total: 34m 7s	remaining: 1h 13m 52s
316:	learn: 0.6288711	total: 34m 14s	remaining: 1h 13m 46s
317:	learn: 0.6288562	total: 34m 21s	remaining: 1h 13m 41s
318:	learn: 0.6288399	total: 34m 27s	remaining: 1h 13m 34s
319:	learn: 0.6288169	total: 34m 34s	remaining: 1h 13m 28s
320:	learn: 0.6288075	total: 34m 41s	remaining: 1h 13m 21s
321:	learn: 0.6287873	total: 34m 47s	remaining: 1h 13m 15s
322:	learn: 0.6287724	total: 34m 53s	remaining: 1h 13m 8s
323:	learn: 0.6287562	total: 35m	remaining: 1h 13m 1s
324:	learn: 0.6287412	total: 35m 7s	remaining: 1h 12m 56s
325:	learn: 0.6287158	total: 35m 13s	remaining: 1h 12m 49s
326:	learn: 0.6287024	total: 35m 19s	remaining: 1h 12m 41s
327:	learn: 0.6286948	total: 35m 25s	remaining: 1h 12m 35s
328:	learn: 0.6286825	total: 35m 32s	remaining: 1h 12m 29s
329:	learn: 0.6286703	total: 35m 39s	remaining: 1h 12m 23s
330:	learn: 0.6286577	total: 35m 45s	remaining: 1h 12m 16s
331:	learn: 0.6286457	total: 35m 51s	remaining: 1h 12m 9s
332:	learn: 0.6286324	total: 35m 58s	remaining: 1h 12m 2s
333:	learn: 0.6286101	total: 36m 4s	remaining: 1h 11m 56s
334:	learn: 0.6285841	total: 36m 11s	remaining: 1h 11m 50s
335:	learn: 0.6285740	total: 36m 17s	remaining: 1h 11m 43s
336:	learn: 0.6285608	total: 36m 23s	remaining: 1h 11m 36s
337:	learn: 0.6285408	total: 36m 29s	remaining: 1h 11m 29s
338:	learn: 0.6285223	total: 36m 36s	remaining: 1h 11m 22s
339:	learn: 0.6285047	total: 36m 42s	remaining: 1h 11m 15s
340:	learn: 0.6284899	total: 36m 48s	remaining: 1h 11m 8s
341:	learn: 0.6284821	total: 36m 55s	remaining: 1h 11m 1s
342:	learn: 0.6284624	total: 37m 1s	remaining: 1h 10m 54s
343:	learn: 0.6284567	total: 37m 7s	remaining: 1h 10m 47s
344:	learn: 0.6284439	total: 37m 13s	remaining: 1h 10m 40s
345:	learn: 0.6284299	total: 37m 20s	remaining: 1h 10m 34s
346:	learn: 0.6284179	total: 37m 26s	remaining: 1h 10m 27s
347:	learn: 0.6284070	total: 37m 32s	remaining: 1h 10m 21s
348:	learn: 0.6283975	total: 37m 39s	remaining: 1h 10m 15s
349:	learn: 0.6283895	total: 37m 46s	remaining: 1h 10m 8s
350:	learn: 0.6283772	total: 37m 52s	remaining: 1h 10m 1s
351:	learn: 0.6283711	total: 37m 59s	remaining: 1h 9m 56s
352:	learn: 0.6283552	total: 38m 5s	remaining: 1h 9m 49s

353:	learn: 0.6283473	total: 38m 12s	remaining: 1h 9m 44s
354:	learn: 0.6283269	total: 38m 18s	remaining: 1h 9m 36s
355:	learn: 0.6283106	total: 38m 25s	remaining: 1h 9m 30s
356:	learn: 0.6283031	total: 38m 32s	remaining: 1h 9m 25s
357:	learn: 0.6282854	total: 38m 38s	remaining: 1h 9m 18s
358:	learn: 0.6282691	total: 38m 44s	remaining: 1h 9m 10s
359:	learn: 0.6282516	total: 38m 50s	remaining: 1h 9m 2s
360:	learn: 0.6282466	total: 38m 56s	remaining: 1h 8m 56s
361:	learn: 0.6282355	total: 39m 3s	remaining: 1h 8m 49s
362:	learn: 0.6282218	total: 39m 9s	remaining: 1h 8m 43s
363:	learn: 0.6282132	total: 39m 16s	remaining: 1h 8m 37s
364:	learn: 0.6281864	total: 39m 22s	remaining: 1h 8m 30s
365:	learn: 0.6281737	total: 39m 28s	remaining: 1h 8m 23s
366:	learn: 0.6281683	total: 39m 34s	remaining: 1h 8m 15s
367:	learn: 0.6281502	total: 39m 41s	remaining: 1h 8m 9s
368:	learn: 0.6281365	total: 39m 47s	remaining: 1h 8m 3s
369:	learn: 0.6281289	total: 39m 54s	remaining: 1h 7m 56s
370:	learn: 0.6281269	total: 40m	remaining: 1h 7m 49s
371:	learn: 0.6281112	total: 40m 6s	remaining: 1h 7m 42s
372:	learn: 0.6280958	total: 40m 13s	remaining: 1h 7m 36s
373:	learn: 0.6280880	total: 40m 19s	remaining: 1h 7m 29s
374:	learn: 0.6280752	total: 40m 25s	remaining: 1h 7m 22s
375:	learn: 0.6280586	total: 40m 32s	remaining: 1h 7m 16s
376:	learn: 0.6280497	total: 40m 38s	remaining: 1h 7m 9s
377:	learn: 0.6280360	total: 40m 44s	remaining: 1h 7m 3s
378:	learn: 0.6280125	total: 40m 51s	remaining: 1h 6m 56s
379:	learn: 0.6280015	total: 40m 57s	remaining: 1h 6m 49s
380:	learn: 0.6279938	total: 41m 3s	remaining: 1h 6m 42s
381:	learn: 0.6279818	total: 41m 9s	remaining: 1h 6m 35s
382:	learn: 0.6279702	total: 41m 15s	remaining: 1h 6m 28s
383:	learn: 0.6279567	total: 41m 21s	remaining: 1h 6m 21s
384:	learn: 0.6279386	total: 41m 27s	remaining: 1h 6m 13s
385:	learn: 0.6279223	total: 41m 34s	remaining: 1h 6m 8s
386:	learn: 0.6278969	total: 41m 41s	remaining: 1h 6m 1s
387:	learn: 0.6278802	total: 41m 47s	remaining: 1h 5m 55s
388:	learn: 0.6278692	total: 41m 54s	remaining: 1h 5m 48s
389:	learn: 0.6278543	total: 42m	remaining: 1h 5m 42s
390:	learn: 0.6278455	total: 42m 7s	remaining: 1h 5m 36s
391:	learn: 0.6278271	total: 42m 13s	remaining: 1h 5m 29s
392:	learn: 0.6278112	total: 42m 19s	remaining: 1h 5m 23s
393:	learn: 0.6277953	total: 42m 25s	remaining: 1h 5m 15s
394:	learn: 0.6277846	total: 42m 31s	remaining: 1h 5m 8s
395:	learn: 0.6277632	total: 42m 37s	remaining: 1h 5m 1s
396:	learn: 0.6277531	total: 42m 44s	remaining: 1h 4m 54s
397:	learn: 0.6277421	total: 42m 49s	remaining: 1h 4m 47s
398:	learn: 0.6277271	total: 42m 56s	remaining: 1h 4m 40s
399:	learn: 0.6277218	total: 43m 3s	remaining: 1h 4m 34s
400:	learn: 0.6277072	total: 43m 9s	remaining: 1h 4m 28s

401:	learn: 0.6276929	total: 43m 15s	remaining: 1h 4m 21s
402:	learn: 0.6276800	total: 43m 21s	remaining: 1h 4m 14s
403:	learn: 0.6276716	total: 43m 27s	remaining: 1h 4m 6s
404:	learn: 0.6276602	total: 43m 34s	remaining: 1h 4m
405:	learn: 0.6276562	total: 43m 39s	remaining: 1h 3m 52s
406:	learn: 0.6276467	total: 43m 47s	remaining: 1h 3m 48s
407:	learn: 0.6276416	total: 43m 54s	remaining: 1h 3m 43s
408:	learn: 0.6276259	total: 44m 3s	remaining: 1h 3m 39s
409:	learn: 0.6276182	total: 44m 12s	remaining: 1h 3m 37s
410:	learn: 0.6276038	total: 44m 20s	remaining: 1h 3m 32s
411:	learn: 0.6275933	total: 44m 27s	remaining: 1h 3m 26s
412:	learn: 0.6275829	total: 44m 33s	remaining: 1h 3m 20s
413:	learn: 0.6275726	total: 44m 39s	remaining: 1h 3m 12s
414:	learn: 0.6275626	total: 44m 45s	remaining: 1h 3m 6s
415:	learn: 0.6275539	total: 44m 51s	remaining: 1h 2m 58s
416:	learn: 0.6275442	total: 44m 56s	remaining: 1h 2m 50s
417:	learn: 0.6275345	total: 45m 3s	remaining: 1h 2m 43s
418:	learn: 0.6275224	total: 45m 9s	remaining: 1h 2m 37s
419:	learn: 0.6275001	total: 45m 16s	remaining: 1h 2m 30s
420:	learn: 0.6274864	total: 45m 22s	remaining: 1h 2m 24s
421:	learn: 0.6274735	total: 45m 27s	remaining: 1h 2m 16s
422:	learn: 0.6274600	total: 45m 33s	remaining: 1h 2m 8s
423:	learn: 0.6274463	total: 45m 39s	remaining: 1h 2m 1s
424:	learn: 0.6274319	total: 45m 46s	remaining: 1h 1m 55s
425:	learn: 0.6274227	total: 45m 52s	remaining: 1h 1m 49s
426:	learn: 0.6274088	total: 45m 59s	remaining: 1h 1m 42s
427:	learn: 0.6273948	total: 46m 6s	remaining: 1h 1m 36s
428:	learn: 0.6273904	total: 46m 12s	remaining: 1h 1m 30s
429:	learn: 0.6273799	total: 46m 19s	remaining: 1h 1m 24s
430:	learn: 0.6273659	total: 46m 26s	remaining: 1h 1m 18s
431:	learn: 0.6273414	total: 46m 33s	remaining: 1h 1m 13s
432:	learn: 0.6273356	total: 46m 41s	remaining: 1h 1m 7s
433:	learn: 0.6273307	total: 46m 48s	remaining: 1h 1m 3s
434:	learn: 0.6273131	total: 46m 56s	remaining: 1h 58s
435:	learn: 0.6272952	total: 47m 4s	remaining: 1h 53s
436:	learn: 0.6272826	total: 47m 11s	remaining: 1h 47s
437:	learn: 0.6272752	total: 47m 18s	remaining: 1h 42s
438:	learn: 0.6272645	total: 47m 25s	remaining: 1h 36s
439:	learn: 0.6272542	total: 47m 32s	remaining: 1h 30s
440:	learn: 0.6272470	total: 47m 38s	remaining: 1h 23s
441:	learn: 0.6272301	total: 47m 45s	remaining: 1h 16s
442:	learn: 0.6272233	total: 47m 51s	remaining: 1h 10s
443:	learn: 0.6272141	total: 47m 58s	remaining: 1h 4s
444:	learn: 0.6271999	total: 48m 6s	remaining: 59m 59s
445:	learn: 0.6271886	total: 48m 13s	remaining: 59m 53s
446:	learn: 0.6271710	total: 48m 19s	remaining: 59m 47s
447:	learn: 0.6271607	total: 48m 25s	remaining: 59m 40s
448:	learn: 0.6271561	total: 48m 32s	remaining: 59m 34s

449:	learn: 0.6271434	total: 48m 39s	remaining: 59m 27s
450:	learn: 0.6271312	total: 48m 45s	remaining: 59m 21s
451:	learn: 0.6271220	total: 48m 52s	remaining: 59m 15s
452:	learn: 0.6271036	total: 48m 59s	remaining: 59m 8s
453:	learn: 0.6270885	total: 49m 5s	remaining: 59m 2s
454:	learn: 0.6270701	total: 49m 11s	remaining: 58m 54s
455:	learn: 0.6270583	total: 49m 17s	remaining: 58m 48s
456:	learn: 0.6270561	total: 49m 24s	remaining: 58m 42s
457:	learn: 0.6270421	total: 49m 30s	remaining: 58m 35s
458:	learn: 0.6270313	total: 49m 37s	remaining: 58m 28s
459:	learn: 0.6270257	total: 49m 43s	remaining: 58m 22s
460:	learn: 0.6270173	total: 49m 48s	remaining: 58m 13s
461:	learn: 0.6270147	total: 49m 55s	remaining: 58m 7s
462:	learn: 0.6269976	total: 50m 2s	remaining: 58m 1s
463:	learn: 0.6269920	total: 50m 8s	remaining: 57m 55s
464:	learn: 0.6269866	total: 50m 14s	remaining: 57m 48s
465:	learn: 0.6269735	total: 50m 21s	remaining: 57m 42s
466:	learn: 0.6269589	total: 50m 27s	remaining: 57m 35s
467:	learn: 0.6269487	total: 50m 34s	remaining: 57m 29s
468:	learn: 0.6269374	total: 50m 40s	remaining: 57m 22s
469:	learn: 0.6269250	total: 50m 47s	remaining: 57m 16s
470:	learn: 0.6269186	total: 50m 52s	remaining: 57m 8s
471:	learn: 0.6269078	total: 50m 58s	remaining: 57m 1s
472:	learn: 0.6269020	total: 51m 4s	remaining: 56m 54s
473:	learn: 0.6268982	total: 51m 9s	remaining: 56m 46s
474:	learn: 0.6268904	total: 51m 16s	remaining: 56m 39s
475:	learn: 0.6268819	total: 51m 22s	remaining: 56m 33s
476:	learn: 0.6268684	total: 51m 29s	remaining: 56m 27s
477:	learn: 0.6268583	total: 51m 35s	remaining: 56m 20s
478:	learn: 0.6268421	total: 51m 42s	remaining: 56m 14s
479:	learn: 0.6268331	total: 51m 48s	remaining: 56m 7s
480:	learn: 0.6268249	total: 51m 54s	remaining: 56m 1s
481:	learn: 0.6268147	total: 52m 1s	remaining: 55m 54s
482:	learn: 0.6268076	total: 52m 7s	remaining: 55m 48s
483:	learn: 0.6268004	total: 52m 14s	remaining: 55m 41s
484:	learn: 0.6267914	total: 52m 20s	remaining: 55m 34s
485:	learn: 0.6267828	total: 52m 26s	remaining: 55m 28s
486:	learn: 0.6267729	total: 52m 33s	remaining: 55m 21s
487:	learn: 0.6267638	total: 52m 41s	remaining: 55m 16s
488:	learn: 0.6267582	total: 52m 48s	remaining: 55m 11s
489:	learn: 0.6267510	total: 52m 55s	remaining: 55m 5s
490:	learn: 0.6267408	total: 53m 2s	remaining: 54m 59s
491:	learn: 0.6267311	total: 53m 9s	remaining: 54m 53s
492:	learn: 0.6267216	total: 53m 15s	remaining: 54m 46s
493:	learn: 0.6267092	total: 53m 22s	remaining: 54m 40s
494:	learn: 0.6266972	total: 53m 28s	remaining: 54m 33s
495:	learn: 0.6266818	total: 53m 35s	remaining: 54m 27s
496:	learn: 0.6266766	total: 53m 41s	remaining: 54m 20s

497:	learn: 0.6266590	total: 53m 48s	remaining: 54m 14s
498:	learn: 0.6266457	total: 53m 55s	remaining: 54m 8s
499:	learn: 0.6266401	total: 54m	remaining: 54m
500:	learn: 0.6266326	total: 54m 7s	remaining: 53m 54s
501:	learn: 0.6266134	total: 54m 12s	remaining: 53m 46s
502:	learn: 0.6266031	total: 54m 19s	remaining: 53m 40s
503:	learn: 0.6265928	total: 54m 25s	remaining: 53m 34s
504:	learn: 0.6265865	total: 54m 33s	remaining: 53m 28s
505:	learn: 0.6265799	total: 54m 40s	remaining: 53m 23s
506:	learn: 0.6265737	total: 54m 47s	remaining: 53m 16s
507:	learn: 0.6265626	total: 54m 54s	remaining: 53m 11s
508:	learn: 0.6265517	total: 55m 1s	remaining: 53m 5s
509:	learn: 0.6265430	total: 55m 8s	remaining: 52m 58s
510:	learn: 0.6265398	total: 55m 14s	remaining: 52m 52s
511:	learn: 0.6265298	total: 55m 20s	remaining: 52m 45s
512:	learn: 0.6265147	total: 55m 26s	remaining: 52m 38s
513:	learn: 0.6265056	total: 55m 33s	remaining: 52m 32s
514:	learn: 0.6265000	total: 55m 40s	remaining: 52m 25s
515:	learn: 0.6264969	total: 55m 47s	remaining: 52m 19s
516:	learn: 0.6264874	total: 55m 53s	remaining: 52m 12s
517:	learn: 0.6264815	total: 56m	remaining: 52m 7s
518:	learn: 0.6264670	total: 56m 7s	remaining: 52m
519:	learn: 0.6264576	total: 56m 13s	remaining: 51m 54s
520:	learn: 0.6264450	total: 56m 19s	remaining: 51m 47s
521:	learn: 0.6264302	total: 56m 26s	remaining: 51m 40s
522:	learn: 0.6264188	total: 56m 33s	remaining: 51m 34s
523:	learn: 0.6264153	total: 56m 39s	remaining: 51m 28s
524:	learn: 0.6264098	total: 56m 44s	remaining: 51m 20s
525:	learn: 0.6263963	total: 56m 50s	remaining: 51m 13s
526:	learn: 0.6263858	total: 56m 56s	remaining: 51m 6s
527:	learn: 0.6263780	total: 57m 3s	remaining: 51m
528:	learn: 0.6263656	total: 57m 10s	remaining: 50m 53s
529:	learn: 0.6263556	total: 57m 16s	remaining: 50m 47s
530:	learn: 0.6263439	total: 57m 22s	remaining: 50m 40s
531:	learn: 0.6263355	total: 57m 28s	remaining: 50m 33s
532:	learn: 0.6263305	total: 57m 35s	remaining: 50m 27s
533:	learn: 0.6263246	total: 57m 42s	remaining: 50m 21s
534:	learn: 0.6263184	total: 57m 48s	remaining: 50m 15s
535:	learn: 0.6263072	total: 57m 54s	remaining: 50m 7s
536:	learn: 0.6262918	total: 58m 1s	remaining: 50m 1s
537:	learn: 0.6262859	total: 58m 8s	remaining: 49m 55s
538:	learn: 0.6262805	total: 58m 15s	remaining: 49m 49s
539:	learn: 0.6262760	total: 58m 21s	remaining: 49m 42s
540:	learn: 0.6262692	total: 58m 28s	remaining: 49m 36s
541:	learn: 0.6262572	total: 58m 34s	remaining: 49m 29s
542:	learn: 0.6262499	total: 58m 40s	remaining: 49m 23s
543:	learn: 0.6262363	total: 58m 46s	remaining: 49m 16s
544:	learn: 0.6262242	total: 58m 53s	remaining: 49m 10s

545:	learn: 0.6262200	total: 59m	remaining: 49m 4s
546:	learn: 0.6262109	total: 59m 6s	remaining: 48m 57s
547:	learn: 0.6261971	total: 59m 13s	remaining: 48m 51s
548:	learn: 0.6261863	total: 59m 19s	remaining: 48m 44s
549:	learn: 0.6261740	total: 59m 25s	remaining: 48m 37s
550:	learn: 0.6261660	total: 59m 31s	remaining: 48m 30s
551:	learn: 0.6261545	total: 59m 38s	remaining: 48m 23s
552:	learn: 0.6261416	total: 59m 44s	remaining: 48m 17s
553:	learn: 0.6261381	total: 59m 51s	remaining: 48m 10s
554:	learn: 0.6261336	total: 59m 57s	remaining: 48m 4s
555:	learn: 0.6261260	total: 1h 4s	remaining: 47m 58s
556:	learn: 0.6261158	total: 1h 10s	remaining: 47m 51s
557:	learn: 0.6261053	total: 1h 15s	remaining: 47m 44s
558:	learn: 0.6260954	total: 1h 22s	remaining: 47m 37s
559:	learn: 0.6260850	total: 1h 29s	remaining: 47m 31s
560:	learn: 0.6260759	total: 1h 34s	remaining: 47m 24s
561:	learn: 0.6260669	total: 1h 41s	remaining: 47m 17s
562:	learn: 0.6260570	total: 1h 47s	remaining: 47m 11s
563:	learn: 0.6260549	total: 1h 54s	remaining: 47m 4s
564:	learn: 0.6260421	total: 1h 1m	remaining: 46m 58s
565:	learn: 0.6260343	total: 1h 1m 6s	remaining: 46m 51s
566:	learn: 0.6260253	total: 1h 1m 13s	remaining: 46m 45s
567:	learn: 0.6260204	total: 1h 1m 20s	remaining: 46m 39s
568:	learn: 0.6260155	total: 1h 1m 26s	remaining: 46m 32s
569:	learn: 0.6260048	total: 1h 1m 33s	remaining: 46m 26s
570:	learn: 0.6259922	total: 1h 1m 39s	remaining: 46m 19s
571:	learn: 0.6259893	total: 1h 1m 46s	remaining: 46m 13s
572:	learn: 0.6259845	total: 1h 1m 53s	remaining: 46m 7s
573:	learn: 0.6259780	total: 1h 1m 59s	remaining: 46m
574:	learn: 0.6259677	total: 1h 2m 5s	remaining: 45m 53s
575:	learn: 0.6259652	total: 1h 2m 12s	remaining: 45m 47s
576:	learn: 0.6259505	total: 1h 2m 18s	remaining: 45m 40s
577:	learn: 0.6259463	total: 1h 2m 25s	remaining: 45m 34s
578:	learn: 0.6259342	total: 1h 2m 32s	remaining: 45m 28s
579:	learn: 0.6259283	total: 1h 2m 38s	remaining: 45m 21s
580:	learn: 0.6259173	total: 1h 2m 45s	remaining: 45m 15s
581:	learn: 0.6259072	total: 1h 2m 51s	remaining: 45m 8s
582:	learn: 0.6258949	total: 1h 2m 57s	remaining: 45m 2s
583:	learn: 0.6258827	total: 1h 3m 4s	remaining: 44m 55s
584:	learn: 0.6258724	total: 1h 3m 10s	remaining: 44m 49s
585:	learn: 0.6258646	total: 1h 3m 16s	remaining: 44m 42s
586:	learn: 0.6258523	total: 1h 3m 23s	remaining: 44m 35s
587:	learn: 0.6258506	total: 1h 3m 29s	remaining: 44m 29s
588:	learn: 0.6258426	total: 1h 3m 35s	remaining: 44m 22s
589:	learn: 0.6258367	total: 1h 3m 41s	remaining: 44m 15s
590:	learn: 0.6258317	total: 1h 3m 48s	remaining: 44m 9s
591:	learn: 0.6258173	total: 1h 3m 54s	remaining: 44m 2s
592:	learn: 0.6258148	total: 1h 4m	remaining: 43m 55s

593:	learn: 0.6258095	total: 1h 4m 7s	remaining: 43m 49s
594:	learn: 0.6258015	total: 1h 4m 13s	remaining: 43m 42s
595:	learn: 0.6257797	total: 1h 4m 19s	remaining: 43m 36s
596:	learn: 0.6257714	total: 1h 4m 25s	remaining: 43m 29s
597:	learn: 0.6257602	total: 1h 4m 32s	remaining: 43m 23s
598:	learn: 0.6257558	total: 1h 4m 38s	remaining: 43m 16s
599:	learn: 0.6257493	total: 1h 4m 44s	remaining: 43m 9s
600:	learn: 0.6257439	total: 1h 4m 50s	remaining: 43m 3s
601:	learn: 0.6257378	total: 1h 4m 57s	remaining: 42m 56s
602:	learn: 0.6257346	total: 1h 5m 3s	remaining: 42m 50s
603:	learn: 0.6257266	total: 1h 5m 10s	remaining: 42m 43s
604:	learn: 0.6257164	total: 1h 5m 16s	remaining: 42m 37s
605:	learn: 0.6257125	total: 1h 5m 23s	remaining: 42m 30s
606:	learn: 0.6257028	total: 1h 5m 29s	remaining: 42m 24s
607:	learn: 0.6256943	total: 1h 5m 36s	remaining: 42m 18s
608:	learn: 0.6256880	total: 1h 5m 43s	remaining: 42m 11s
609:	learn: 0.6256800	total: 1h 5m 49s	remaining: 42m 5s
610:	learn: 0.6256749	total: 1h 5m 56s	remaining: 41m 59s
611:	learn: 0.6256645	total: 1h 6m 3s	remaining: 41m 52s
612:	learn: 0.6256500	total: 1h 6m 9s	remaining: 41m 46s
613:	learn: 0.6256418	total: 1h 6m 16s	remaining: 41m 39s
614:	learn: 0.6256342	total: 1h 6m 22s	remaining: 41m 32s
615:	learn: 0.6256231	total: 1h 6m 28s	remaining: 41m 26s
616:	learn: 0.6256173	total: 1h 6m 34s	remaining: 41m 19s
617:	learn: 0.6256104	total: 1h 6m 41s	remaining: 41m 13s
618:	learn: 0.6256040	total: 1h 6m 48s	remaining: 41m 7s
619:	learn: 0.6255899	total: 1h 6m 55s	remaining: 41m 1s
620:	learn: 0.6255807	total: 1h 7m 1s	remaining: 40m 54s
621:	learn: 0.6255766	total: 1h 7m 8s	remaining: 40m 48s
622:	learn: 0.6255698	total: 1h 7m 15s	remaining: 40m 41s
623:	learn: 0.6255614	total: 1h 7m 22s	remaining: 40m 35s
624:	learn: 0.6255487	total: 1h 7m 28s	remaining: 40m 29s
625:	learn: 0.6255410	total: 1h 7m 35s	remaining: 40m 23s
626:	learn: 0.6255367	total: 1h 7m 42s	remaining: 40m 16s
627:	learn: 0.6255273	total: 1h 7m 49s	remaining: 40m 10s
628:	learn: 0.6255144	total: 1h 7m 54s	remaining: 40m 3s
629:	learn: 0.6255097	total: 1h 8m 1s	remaining: 39m 57s
630:	learn: 0.6255018	total: 1h 8m 8s	remaining: 39m 50s
631:	learn: 0.6254936	total: 1h 8m 14s	remaining: 39m 44s
632:	learn: 0.6254877	total: 1h 8m 20s	remaining: 39m 37s
633:	learn: 0.6254773	total: 1h 8m 26s	remaining: 39m 30s
634:	learn: 0.6254722	total: 1h 8m 32s	remaining: 39m 24s
635:	learn: 0.6254619	total: 1h 8m 39s	remaining: 39m 17s
636:	learn: 0.6254528	total: 1h 8m 45s	remaining: 39m 10s
637:	learn: 0.6254473	total: 1h 8m 51s	remaining: 39m 4s
638:	learn: 0.6254373	total: 1h 8m 57s	remaining: 38m 57s
639:	learn: 0.6254262	total: 1h 9m 4s	remaining: 38m 51s
640:	learn: 0.6254153	total: 1h 9m 10s	remaining: 38m 44s

641:	learn: 0.6254094	total: 1h 9m 16s	remaining: 38m 38s
642:	learn: 0.6253979	total: 1h 9m 23s	remaining: 38m 31s
643:	learn: 0.6253912	total: 1h 9m 28s	remaining: 38m 24s
644:	learn: 0.6253798	total: 1h 9m 34s	remaining: 38m 17s
645:	learn: 0.6253775	total: 1h 9m 41s	remaining: 38m 11s
646:	learn: 0.6253676	total: 1h 9m 47s	remaining: 38m 4s
647:	learn: 0.6253445	total: 1h 9m 53s	remaining: 37m 57s
648:	learn: 0.6253324	total: 1h 9m 59s	remaining: 37m 51s
649:	learn: 0.6253243	total: 1h 10m 6s	remaining: 37m 44s
650:	learn: 0.6253154	total: 1h 10m 11s	remaining: 37m 38s
651:	learn: 0.6253030	total: 1h 10m 17s	remaining: 37m 31s
652:	learn: 0.6252977	total: 1h 10m 23s	remaining: 37m 24s
653:	learn: 0.6252886	total: 1h 10m 29s	remaining: 37m 17s
654:	learn: 0.6252842	total: 1h 10m 36s	remaining: 37m 11s
655:	learn: 0.6252807	total: 1h 10m 42s	remaining: 37m 4s
656:	learn: 0.6252744	total: 1h 10m 49s	remaining: 36m 58s
657:	learn: 0.6252712	total: 1h 10m 55s	remaining: 36m 51s
658:	learn: 0.6252614	total: 1h 11m 2s	remaining: 36m 45s
659:	learn: 0.6252570	total: 1h 11m 8s	remaining: 36m 39s
660:	learn: 0.6252445	total: 1h 11m 15s	remaining: 36m 32s
661:	learn: 0.6252359	total: 1h 11m 21s	remaining: 36m 25s
662:	learn: 0.6252272	total: 1h 11m 27s	remaining: 36m 19s
663:	learn: 0.6252234	total: 1h 11m 33s	remaining: 36m 12s
664:	learn: 0.6252191	total: 1h 11m 40s	remaining: 36m 6s
665:	learn: 0.6252160	total: 1h 11m 46s	remaining: 35m 59s
666:	learn: 0.6252059	total: 1h 11m 52s	remaining: 35m 53s
667:	learn: 0.6251956	total: 1h 11m 59s	remaining: 35m 46s
668:	learn: 0.6251840	total: 1h 12m 5s	remaining: 35m 40s
669:	learn: 0.6251760	total: 1h 12m 12s	remaining: 35m 33s
670:	learn: 0.6251678	total: 1h 12m 18s	remaining: 35m 27s
671:	learn: 0.6251619	total: 1h 12m 25s	remaining: 35m 20s
672:	learn: 0.6251573	total: 1h 12m 30s	remaining: 35m 13s
673:	learn: 0.6251489	total: 1h 12m 37s	remaining: 35m 7s
674:	learn: 0.6251446	total: 1h 12m 44s	remaining: 35m 1s
675:	learn: 0.6251364	total: 1h 12m 50s	remaining: 34m 54s
676:	learn: 0.6251255	total: 1h 12m 56s	remaining: 34m 48s
677:	learn: 0.6251211	total: 1h 13m 3s	remaining: 34m 41s
678:	learn: 0.6251105	total: 1h 13m 9s	remaining: 34m 35s
679:	learn: 0.6250980	total: 1h 13m 15s	remaining: 34m 28s
680:	learn: 0.6250897	total: 1h 13m 21s	remaining: 34m 21s
681:	learn: 0.6250841	total: 1h 13m 28s	remaining: 34m 15s
682:	learn: 0.6250738	total: 1h 13m 34s	remaining: 34m 8s
683:	learn: 0.6250635	total: 1h 13m 40s	remaining: 34m 2s
684:	learn: 0.6250556	total: 1h 13m 47s	remaining: 33m 55s
685:	learn: 0.6250535	total: 1h 13m 53s	remaining: 33m 49s
686:	learn: 0.6250494	total: 1h 14m 1s	remaining: 33m 43s
687:	learn: 0.6250298	total: 1h 14m 7s	remaining: 33m 36s
688:	learn: 0.6250223	total: 1h 14m 14s	remaining: 33m 30s

689:	learn: 0.6250206	total: 1h 14m 20s	remaining: 33m 23s
690:	learn: 0.6250088	total: 1h 14m 27s	remaining: 33m 17s
691:	learn: 0.6250004	total: 1h 14m 33s	remaining: 33m 11s
692:	learn: 0.6249966	total: 1h 14m 40s	remaining: 33m 4s
693:	learn: 0.6249843	total: 1h 14m 46s	remaining: 32m 58s
694:	learn: 0.6249692	total: 1h 14m 52s	remaining: 32m 51s
695:	learn: 0.6249618	total: 1h 14m 59s	remaining: 32m 45s
696:	learn: 0.6249554	total: 1h 15m 5s	remaining: 32m 38s
697:	learn: 0.6249485	total: 1h 15m 11s	remaining: 32m 32s
698:	learn: 0.6249408	total: 1h 15m 17s	remaining: 32m 25s
699:	learn: 0.6249393	total: 1h 15m 23s	remaining: 32m 18s
700:	learn: 0.6249308	total: 1h 15m 30s	remaining: 32m 12s
701:	learn: 0.6249248	total: 1h 15m 37s	remaining: 32m 6s
702:	learn: 0.6249150	total: 1h 15m 43s	remaining: 31m 59s
703:	learn: 0.6249045	total: 1h 15m 49s	remaining: 31m 53s
704:	learn: 0.6248981	total: 1h 15m 56s	remaining: 31m 46s
705:	learn: 0.6248854	total: 1h 16m 2s	remaining: 31m 39s
706:	learn: 0.6248723	total: 1h 16m 8s	remaining: 31m 33s
707:	learn: 0.6248653	total: 1h 16m 14s	remaining: 31m 26s
708:	learn: 0.6248596	total: 1h 16m 20s	remaining: 31m 19s
709:	learn: 0.6248519	total: 1h 16m 26s	remaining: 31m 13s
710:	learn: 0.6248493	total: 1h 16m 32s	remaining: 31m 6s
711:	learn: 0.6248442	total: 1h 16m 39s	remaining: 31m
712:	learn: 0.6248389	total: 1h 16m 45s	remaining: 30m 53s
713:	learn: 0.6248334	total: 1h 16m 52s	remaining: 30m 47s
714:	learn: 0.6248257	total: 1h 16m 58s	remaining: 30m 41s
715:	learn: 0.6248202	total: 1h 17m 5s	remaining: 30m 34s
716:	learn: 0.6248141	total: 1h 17m 11s	remaining: 30m 28s
717:	learn: 0.6248097	total: 1h 17m 17s	remaining: 30m 21s
718:	learn: 0.6247997	total: 1h 17m 24s	remaining: 30m 15s
719:	learn: 0.6247936	total: 1h 17m 30s	remaining: 30m 8s
720:	learn: 0.6247872	total: 1h 17m 36s	remaining: 30m 2s
721:	learn: 0.6247833	total: 1h 17m 43s	remaining: 29m 55s
722:	learn: 0.6247781	total: 1h 17m 50s	remaining: 29m 49s
723:	learn: 0.6247732	total: 1h 17m 56s	remaining: 29m 42s
724:	learn: 0.6247698	total: 1h 18m 3s	remaining: 29m 36s
725:	learn: 0.6247530	total: 1h 18m 9s	remaining: 29m 29s
726:	learn: 0.6247465	total: 1h 18m 15s	remaining: 29m 23s
727:	learn: 0.6247350	total: 1h 18m 21s	remaining: 29m 16s
728:	learn: 0.6247296	total: 1h 18m 28s	remaining: 29m 10s
729:	learn: 0.6247219	total: 1h 18m 34s	remaining: 29m 3s
730:	learn: 0.6247118	total: 1h 18m 40s	remaining: 28m 57s
731:	learn: 0.6247083	total: 1h 18m 47s	remaining: 28m 50s
732:	learn: 0.6246977	total: 1h 18m 53s	remaining: 28m 44s
733:	learn: 0.6246938	total: 1h 18m 59s	remaining: 28m 37s
734:	learn: 0.6246877	total: 1h 19m 5s	remaining: 28m 31s
735:	learn: 0.6246774	total: 1h 19m 12s	remaining: 28m 24s
736:	learn: 0.6246724	total: 1h 19m 18s	remaining: 28m 18s

737:	learn: 0.6246646	total: 1h 19m 24s	remaining: 28m 11s
738:	learn: 0.6246581	total: 1h 19m 31s	remaining: 28m 5s
739:	learn: 0.6246529	total: 1h 19m 38s	remaining: 27m 58s
740:	learn: 0.6246512	total: 1h 19m 45s	remaining: 27m 52s
741:	learn: 0.6246496	total: 1h 19m 52s	remaining: 27m 46s
742:	learn: 0.6246391	total: 1h 19m 58s	remaining: 27m 39s
743:	learn: 0.6246341	total: 1h 20m 4s	remaining: 27m 33s
744:	learn: 0.6246267	total: 1h 20m 10s	remaining: 27m 26s
745:	learn: 0.6246161	total: 1h 20m 17s	remaining: 27m 20s
746:	learn: 0.6246027	total: 1h 20m 23s	remaining: 27m 13s
747:	learn: 0.6246003	total: 1h 20m 29s	remaining: 27m 7s
748:	learn: 0.6245982	total: 1h 20m 36s	remaining: 27m
749:	learn: 0.6245974	total: 1h 20m 42s	remaining: 26m 54s
750:	learn: 0.6245864	total: 1h 20m 49s	remaining: 26m 47s
751:	learn: 0.6245762	total: 1h 20m 55s	remaining: 26m 41s
752:	learn: 0.6245669	total: 1h 21m 1s	remaining: 26m 34s
753:	learn: 0.6245628	total: 1h 21m 8s	remaining: 26m 28s
754:	learn: 0.6245590	total: 1h 21m 14s	remaining: 26m 21s
755:	learn: 0.6245470	total: 1h 21m 20s	remaining: 26m 15s
756:	learn: 0.6245426	total: 1h 21m 26s	remaining: 26m 8s
757:	learn: 0.6245392	total: 1h 21m 33s	remaining: 26m 2s
758:	learn: 0.6245305	total: 1h 21m 39s	remaining: 25m 55s
759:	learn: 0.6245220	total: 1h 21m 46s	remaining: 25m 49s
760:	learn: 0.6245188	total: 1h 21m 53s	remaining: 25m 42s
761:	learn: 0.6245139	total: 1h 21m 59s	remaining: 25m 36s
762:	learn: 0.6245093	total: 1h 22m 5s	remaining: 25m 30s
763:	learn: 0.6245030	total: 1h 22m 11s	remaining: 25m 23s
764:	learn: 0.6244948	total: 1h 22m 18s	remaining: 25m 17s
765:	learn: 0.6244862	total: 1h 22m 25s	remaining: 25m 10s
766:	learn: 0.6244780	total: 1h 22m 32s	remaining: 25m 4s
767:	learn: 0.6244665	total: 1h 22m 38s	remaining: 24m 57s
768:	learn: 0.6244573	total: 1h 22m 46s	remaining: 24m 51s
769:	learn: 0.6244501	total: 1h 22m 53s	remaining: 24m 45s
770:	learn: 0.6244387	total: 1h 23m	remaining: 24m 39s
771:	learn: 0.6244281	total: 1h 23m 7s	remaining: 24m 32s
772:	learn: 0.6244189	total: 1h 23m 13s	remaining: 24m 26s
773:	learn: 0.6244050	total: 1h 23m 19s	remaining: 24m 19s
774:	learn: 0.6243956	total: 1h 23m 25s	remaining: 24m 13s
775:	learn: 0.6243852	total: 1h 23m 31s	remaining: 24m 6s
776:	learn: 0.6243808	total: 1h 23m 37s	remaining: 24m
777:	learn: 0.6243773	total: 1h 23m 44s	remaining: 23m 53s
778:	learn: 0.6243744	total: 1h 23m 50s	remaining: 23m 47s
779:	learn: 0.6243659	total: 1h 23m 56s	remaining: 23m 40s
780:	learn: 0.6243605	total: 1h 24m 2s	remaining: 23m 33s
781:	learn: 0.6243538	total: 1h 24m 8s	remaining: 23m 27s
782:	learn: 0.6243492	total: 1h 24m 15s	remaining: 23m 20s
783:	learn: 0.6243385	total: 1h 24m 21s	remaining: 23m 14s
784:	learn: 0.6243337	total: 1h 24m 27s	remaining: 23m 8s

785:	learn: 0.6243214	total: 1h 24m 34s	remaining: 23m 1s
786:	learn: 0.6243116	total: 1h 24m 40s	remaining: 22m 54s
787:	learn: 0.6243031	total: 1h 24m 46s	remaining: 22m 48s
788:	learn: 0.6242946	total: 1h 24m 53s	remaining: 22m 42s
789:	learn: 0.6242872	total: 1h 24m 59s	remaining: 22m 35s
790:	learn: 0.6242831	total: 1h 25m 6s	remaining: 22m 29s
791:	learn: 0.6242777	total: 1h 25m 12s	remaining: 22m 22s
792:	learn: 0.6242752	total: 1h 25m 18s	remaining: 22m 16s
793:	learn: 0.6242686	total: 1h 25m 24s	remaining: 22m 9s
794:	learn: 0.6242639	total: 1h 25m 31s	remaining: 22m 3s
795:	learn: 0.6242602	total: 1h 25m 38s	remaining: 21m 56s
796:	learn: 0.6242537	total: 1h 25m 45s	remaining: 21m 50s
797:	learn: 0.6242484	total: 1h 25m 51s	remaining: 21m 43s
798:	learn: 0.6242441	total: 1h 25m 57s	remaining: 21m 37s
799:	learn: 0.6242395	total: 1h 26m 3s	remaining: 21m 30s
800:	learn: 0.6242323	total: 1h 26m 10s	remaining: 21m 24s
801:	learn: 0.6242308	total: 1h 26m 15s	remaining: 21m 17s
802:	learn: 0.6242238	total: 1h 26m 21s	remaining: 21m 11s
803:	learn: 0.6242148	total: 1h 26m 28s	remaining: 21m 4s
804:	learn: 0.6242058	total: 1h 26m 35s	remaining: 20m 58s
805:	learn: 0.6242050	total: 1h 26m 42s	remaining: 20m 52s
806:	learn: 0.6242003	total: 1h 26m 50s	remaining: 20m 46s
807:	learn: 0.6241933	total: 1h 26m 59s	remaining: 20m 40s
808:	learn: 0.6241878	total: 1h 27m 7s	remaining: 20m 34s
809:	learn: 0.6241785	total: 1h 27m 14s	remaining: 20m 27s
810:	learn: 0.6241728	total: 1h 27m 21s	remaining: 20m 21s
811:	learn: 0.6241636	total: 1h 27m 27s	remaining: 20m 14s
812:	learn: 0.6241572	total: 1h 27m 34s	remaining: 20m 8s
813:	learn: 0.6241555	total: 1h 27m 40s	remaining: 20m 2s
814:	learn: 0.6241539	total: 1h 27m 47s	remaining: 19m 55s
815:	learn: 0.6241451	total: 1h 27m 54s	remaining: 19m 49s
816:	learn: 0.6241397	total: 1h 28m 1s	remaining: 19m 42s
817:	learn: 0.6241306	total: 1h 28m 7s	remaining: 19m 36s
818:	learn: 0.6241219	total: 1h 28m 13s	remaining: 19m 29s
819:	learn: 0.6241157	total: 1h 28m 20s	remaining: 19m 23s
820:	learn: 0.6241079	total: 1h 28m 26s	remaining: 19m 16s
821:	learn: 0.6240991	total: 1h 28m 32s	remaining: 19m 10s
822:	learn: 0.6240951	total: 1h 28m 39s	remaining: 19m 4s
823:	learn: 0.6240903	total: 1h 28m 45s	remaining: 18m 57s
824:	learn: 0.6240886	total: 1h 28m 52s	remaining: 18m 51s
825:	learn: 0.6240862	total: 1h 28m 57s	remaining: 18m 44s
826:	learn: 0.6240775	total: 1h 29m 4s	remaining: 18m 37s
827:	learn: 0.6240734	total: 1h 29m 11s	remaining: 18m 31s
828:	learn: 0.6240650	total: 1h 29m 17s	remaining: 18m 25s
829:	learn: 0.6240616	total: 1h 29m 24s	remaining: 18m 18s
830:	learn: 0.6240531	total: 1h 29m 31s	remaining: 18m 12s
831:	learn: 0.6240483	total: 1h 29m 37s	remaining: 18m 5s
832:	learn: 0.6240453	total: 1h 29m 44s	remaining: 17m 59s

833:	learn: 0.6240421	total: 1h 29m 51s	remaining: 17m 53s
834:	learn: 0.6240354	total: 1h 29m 57s	remaining: 17m 46s
835:	learn: 0.6240287	total: 1h 30m 3s	remaining: 17m 40s
836:	learn: 0.6240267	total: 1h 30m 10s	remaining: 17m 33s
837:	learn: 0.6240246	total: 1h 30m 16s	remaining: 17m 27s
838:	learn: 0.6240207	total: 1h 30m 23s	remaining: 17m 20s
839:	learn: 0.6240069	total: 1h 30m 30s	remaining: 17m 14s
840:	learn: 0.6240042	total: 1h 30m 38s	remaining: 17m 8s
841:	learn: 0.6239980	total: 1h 30m 46s	remaining: 17m 1s
842:	learn: 0.6239889	total: 1h 30m 53s	remaining: 16m 55s
843:	learn: 0.6239836	total: 1h 30m 59s	remaining: 16m 49s
844:	learn: 0.6239772	total: 1h 31m 6s	remaining: 16m 42s
845:	learn: 0.6239713	total: 1h 31m 13s	remaining: 16m 36s
846:	learn: 0.6239688	total: 1h 31m 21s	remaining: 16m 30s
847:	learn: 0.6239570	total: 1h 31m 28s	remaining: 16m 23s
848:	learn: 0.6239507	total: 1h 31m 35s	remaining: 16m 17s
849:	learn: 0.6239499	total: 1h 31m 41s	remaining: 16m 10s
850:	learn: 0.6239459	total: 1h 31m 48s	remaining: 16m 4s
851:	learn: 0.6239399	total: 1h 31m 55s	remaining: 15m 58s
852:	learn: 0.6239341	total: 1h 32m 1s	remaining: 15m 51s
853:	learn: 0.6239303	total: 1h 32m 8s	remaining: 15m 45s
854:	learn: 0.6239252	total: 1h 32m 14s	remaining: 15m 38s
855:	learn: 0.6239113	total: 1h 32m 20s	remaining: 15m 32s
856:	learn: 0.6239049	total: 1h 32m 26s	remaining: 15m 25s
857:	learn: 0.6239003	total: 1h 32m 32s	remaining: 15m 18s
858:	learn: 0.6238952	total: 1h 32m 39s	remaining: 15m 12s
859:	learn: 0.6238912	total: 1h 32m 46s	remaining: 15m 6s
860:	learn: 0.6238858	total: 1h 32m 52s	remaining: 14m 59s
861:	learn: 0.6238803	total: 1h 32m 58s	remaining: 14m 53s
862:	learn: 0.6238796	total: 1h 33m 5s	remaining: 14m 46s
863:	learn: 0.6238705	total: 1h 33m 12s	remaining: 14m 40s
864:	learn: 0.6238704	total: 1h 33m 18s	remaining: 14m 33s
865:	learn: 0.6238690	total: 1h 33m 25s	remaining: 14m 27s
866:	learn: 0.6238656	total: 1h 33m 32s	remaining: 14m 21s
867:	learn: 0.6238516	total: 1h 33m 39s	remaining: 14m 14s
868:	learn: 0.6238445	total: 1h 33m 45s	remaining: 14m 8s
869:	learn: 0.6238319	total: 1h 33m 51s	remaining: 14m 1s
870:	learn: 0.6238311	total: 1h 33m 58s	remaining: 13m 55s
871:	learn: 0.6238269	total: 1h 34m 4s	remaining: 13m 48s
872:	learn: 0.6238190	total: 1h 34m 11s	remaining: 13m 42s
873:	learn: 0.6238165	total: 1h 34m 17s	remaining: 13m 35s
874:	learn: 0.6238087	total: 1h 34m 24s	remaining: 13m 29s
875:	learn: 0.6238036	total: 1h 34m 31s	remaining: 13m 22s
876:	learn: 0.6237987	total: 1h 34m 38s	remaining: 13m 16s
877:	learn: 0.6237937	total: 1h 34m 45s	remaining: 13m 10s
878:	learn: 0.6237909	total: 1h 34m 52s	remaining: 13m 3s
879:	learn: 0.6237839	total: 1h 35m	remaining: 12m 57s
880:	learn: 0.6237744	total: 1h 35m 7s	remaining: 12m 50s

881:	learn: 0.6237674	total: 1h 35m 14s	remaining: 12m 44s
882:	learn: 0.6237535	total: 1h 35m 21s	remaining: 12m 38s
883:	learn: 0.6237525	total: 1h 35m 28s	remaining: 12m 31s
884:	learn: 0.6237500	total: 1h 35m 35s	remaining: 12m 25s
885:	learn: 0.6237469	total: 1h 35m 42s	remaining: 12m 18s
886:	learn: 0.6237468	total: 1h 35m 48s	remaining: 12m 12s
887:	learn: 0.6237463	total: 1h 35m 54s	remaining: 12m 5s
888:	learn: 0.6237407	total: 1h 36m 1s	remaining: 11m 59s
889:	learn: 0.6237356	total: 1h 36m 7s	remaining: 11m 52s
890:	learn: 0.6237324	total: 1h 36m 13s	remaining: 11m 46s
891:	learn: 0.6237250	total: 1h 36m 20s	remaining: 11m 39s
892:	learn: 0.6237201	total: 1h 36m 25s	remaining: 11m 33s
893:	learn: 0.6237128	total: 1h 36m 32s	remaining: 11m 26s
894:	learn: 0.6237044	total: 1h 36m 38s	remaining: 11m 20s
895:	learn: 0.6236981	total: 1h 36m 44s	remaining: 11m 13s
896:	learn: 0.6236892	total: 1h 36m 51s	remaining: 11m 7s
897:	learn: 0.6236798	total: 1h 36m 58s	remaining: 11m
898:	learn: 0.6236776	total: 1h 37m 5s	remaining: 10m 54s
899:	learn: 0.6236639	total: 1h 37m 11s	remaining: 10m 47s
900:	learn: 0.6236576	total: 1h 37m 17s	remaining: 10m 41s
901:	learn: 0.6236513	total: 1h 37m 23s	remaining: 10m 34s
902:	learn: 0.6236440	total: 1h 37m 29s	remaining: 10m 28s
903:	learn: 0.6236417	total: 1h 37m 36s	remaining: 10m 21s
904:	learn: 0.6236285	total: 1h 37m 42s	remaining: 10m 15s
905:	learn: 0.6236212	total: 1h 37m 49s	remaining: 10m 8s
906:	learn: 0.6236172	total: 1h 37m 56s	remaining: 10m 2s
907:	learn: 0.6236133	total: 1h 38m 3s	remaining: 9m 56s
908:	learn: 0.6236090	total: 1h 38m 9s	remaining: 9m 49s
909:	learn: 0.6236031	total: 1h 38m 15s	remaining: 9m 43s
910:	learn: 0.6235990	total: 1h 38m 21s	remaining: 9m 36s
911:	learn: 0.6235971	total: 1h 38m 28s	remaining: 9m 30s
912:	learn: 0.6235900	total: 1h 38m 34s	remaining: 9m 23s
913:	learn: 0.6235835	total: 1h 38m 40s	remaining: 9m 17s
914:	learn: 0.6235761	total: 1h 38m 46s	remaining: 9m 10s
915:	learn: 0.6235732	total: 1h 38m 52s	remaining: 9m 4s
916:	learn: 0.6235718	total: 1h 38m 59s	remaining: 8m 57s
917:	learn: 0.6235668	total: 1h 39m 6s	remaining: 8m 51s
918:	learn: 0.6235611	total: 1h 39m 12s	remaining: 8m 44s
919:	learn: 0.6235518	total: 1h 39m 18s	remaining: 8m 38s
920:	learn: 0.6235477	total: 1h 39m 24s	remaining: 8m 31s
921:	learn: 0.6235408	total: 1h 39m 31s	remaining: 8m 25s
922:	learn: 0.6235349	total: 1h 39m 37s	remaining: 8m 18s
923:	learn: 0.6235329	total: 1h 39m 43s	remaining: 8m 12s
924:	learn: 0.6235312	total: 1h 39m 49s	remaining: 8m 5s
925:	learn: 0.6235254	total: 1h 39m 56s	remaining: 7m 59s
926:	learn: 0.6235238	total: 1h 40m 3s	remaining: 7m 52s
927:	learn: 0.6235167	total: 1h 40m 10s	remaining: 7m 46s
928:	learn: 0.6235130	total: 1h 40m 16s	remaining: 7m 39s

929:	learn: 0.6234973	total: 1h 40m 22s	remaining: 7m 33s
930:	learn: 0.6234959	total: 1h 40m 28s	remaining: 7m 26s
931:	learn: 0.6234866	total: 1h 40m 35s	remaining: 7m 20s
932:	learn: 0.6234817	total: 1h 40m 41s	remaining: 7m 13s
933:	learn: 0.6234729	total: 1h 40m 47s	remaining: 7m 7s
934:	learn: 0.6234679	total: 1h 40m 54s	remaining: 7m
935:	learn: 0.6234666	total: 1h 41m	remaining: 6m 54s
936:	learn: 0.6234597	total: 1h 41m 7s	remaining: 6m 47s
937:	learn: 0.6234556	total: 1h 41m 13s	remaining: 6m 41s
938:	learn: 0.6234511	total: 1h 41m 20s	remaining: 6m 35s
939:	learn: 0.6234498	total: 1h 41m 27s	remaining: 6m 28s
940:	learn: 0.6234418	total: 1h 41m 33s	remaining: 6m 22s
941:	learn: 0.6234367	total: 1h 41m 39s	remaining: 6m 15s
942:	learn: 0.6234316	total: 1h 41m 45s	remaining: 6m 9s
943:	learn: 0.6234222	total: 1h 41m 52s	remaining: 6m 2s
944:	learn: 0.6234222	total: 1h 41m 59s	remaining: 5m 56s
945:	learn: 0.6234166	total: 1h 42m 5s	remaining: 5m 49s
946:	learn: 0.6234121	total: 1h 42m 12s	remaining: 5m 43s
947:	learn: 0.6234022	total: 1h 42m 19s	remaining: 5m 36s
948:	learn: 0.6233952	total: 1h 42m 26s	remaining: 5m 30s
949:	learn: 0.6233898	total: 1h 42m 32s	remaining: 5m 23s
950:	learn: 0.6233835	total: 1h 42m 39s	remaining: 5m 17s
951:	learn: 0.6233813	total: 1h 42m 45s	remaining: 5m 10s
952:	learn: 0.6233718	total: 1h 42m 51s	remaining: 5m 4s
953:	learn: 0.6233638	total: 1h 42m 57s	remaining: 4m 57s
954:	learn: 0.6233589	total: 1h 43m 4s	remaining: 4m 51s
955:	learn: 0.6233581	total: 1h 43m 10s	remaining: 4m 44s
956:	learn: 0.6233497	total: 1h 43m 16s	remaining: 4m 38s
957:	learn: 0.6233452	total: 1h 43m 23s	remaining: 4m 31s
958:	learn: 0.6233364	total: 1h 43m 29s	remaining: 4m 25s
959:	learn: 0.6233295	total: 1h 43m 36s	remaining: 4m 19s
960:	learn: 0.6233264	total: 1h 43m 43s	remaining: 4m 12s
961:	learn: 0.6233244	total: 1h 43m 49s	remaining: 4m 6s
962:	learn: 0.6233202	total: 1h 43m 56s	remaining: 3m 59s
963:	learn: 0.6233121	total: 1h 44m 2s	remaining: 3m 53s
964:	learn: 0.6233067	total: 1h 44m 8s	remaining: 3m 46s
965:	learn: 0.6233009	total: 1h 44m 15s	remaining: 3m 40s
966:	learn: 0.6232983	total: 1h 44m 22s	remaining: 3m 33s
967:	learn: 0.6232915	total: 1h 44m 28s	remaining: 3m 27s
968:	learn: 0.6232840	total: 1h 44m 34s	remaining: 3m 20s
969:	learn: 0.6232825	total: 1h 44m 40s	remaining: 3m 14s
970:	learn: 0.6232767	total: 1h 44m 46s	remaining: 3m 7s
971:	learn: 0.6232709	total: 1h 44m 51s	remaining: 3m 1s
972:	learn: 0.6232653	total: 1h 44m 58s	remaining: 2m 54s
973:	learn: 0.6232616	total: 1h 45m 4s	remaining: 2m 48s
974:	learn: 0.6232590	total: 1h 45m 11s	remaining: 2m 41s
975:	learn: 0.6232520	total: 1h 45m 17s	remaining: 2m 35s
976:	learn: 0.6232451	total: 1h 45m 23s	remaining: 2m 28s

977:	learn: 0.6232423	total: 1h 45m 29s	remaining: 2m 22s
978:	learn: 0.6232375	total: 1h 45m 36s	remaining: 2m 15s
979:	learn: 0.6232231	total: 1h 45m 43s	remaining: 2m 9s
980:	learn: 0.6232171	total: 1h 45m 49s	remaining: 2m 2s
981:	learn: 0.6232136	total: 1h 45m 55s	remaining: 1m 56s
982:	learn: 0.6232081	total: 1h 46m 2s	remaining: 1m 50s
983:	learn: 0.6232012	total: 1h 46m 8s	remaining: 1m 43s
984:	learn: 0.6231966	total: 1h 46m 14s	remaining: 1m 37s
985:	learn: 0.6231940	total: 1h 46m 20s	remaining: 1m 30s
986:	learn: 0.6231883	total: 1h 46m 27s	remaining: 1m 24s
987:	learn: 0.6231842	total: 1h 46m 33s	remaining: 1m 17s
988:	learn: 0.6231801	total: 1h 46m 40s	remaining: 1m 11s
989:	learn: 0.6231769	total: 1h 46m 47s	remaining: 1m 4s
990:	learn: 0.6231695	total: 1h 46m 53s	remaining: 58.2s
991:	learn: 0.6231630	total: 1h 47m 1s	remaining: 51.8s
992:	learn: 0.6231567	total: 1h 47m 7s	remaining: 45.3s
993:	learn: 0.6231508	total: 1h 47m 14s	remaining: 38.8s
994:	learn: 0.6231487	total: 1h 47m 21s	remaining: 32.4s
995:	learn: 0.6231423	total: 1h 47m 27s	remaining: 25.9s
996:	learn: 0.6231362	total: 1h 47m 34s	remaining: 19.4s
997:	learn: 0.6231325	total: 1h 47m 41s	remaining: 12.9s
998:	learn: 0.6231275	total: 1h 47m 48s	remaining: 6.47s
999:	learn: 0.6231240	total: 1h 47m 54s	remaining: 0us

CPU times: user 20h 15min 28s, sys: 8min 2s, total: 20h 23min 31s
Wall time: 1h 48min 39s

```
[20]: %%time

# Predict class
pred_train = cat_boost.predict(X_train)
pred_test = cat_boost.predict(X_test)

# Predict probability
pred_score_train = cat_boost.predict_proba(X_train)[: , 1]
pred_score_test = cat_boost.predict_proba(X_test)[: , 1]

print('Accuracy in training set: {:.3f}'.format(accuracy_score(y_train,
    ↪pred_train)))
print('Accuracy in testing set: {:.3f}'.format(accuracy_score(y_test,
    ↪pred_test)))

print('\nAUC in training set: {:.3f}'.format(roc_auc_score(y_train,
    ↪pred_score_train)))
print('AUC in testing set: {:.3f}'.format(roc_auc_score(y_test,
    ↪pred_score_test)))
```

Accuracy in training set: 0.650

Accuracy in testing set: 0.645

AUC in training set: 0.708

AUC in testing set: 0.700

CPU times: user 7min 16s, sys: 7.76 s, total: 7min 24s

Wall time: 1min 42s

```
[21]: %%script false --no-raise-error

# Prediction score/probability
pred_score_test = cat_boost.predict_proba(X_test)[:, 1]

fpr, tpr, thresholds = roc_curve(y_test, pred_score_test)
auc_score = roc_auc_score(y_test, pred_score_test)

def plot_roc_curve(fpr, tpr, auc_score, legend=None):
    plt.plot(fpr, tpr, linewidth=2, c='red')
    plt.plot([0, 1], [0, 1], 'k--')
    plt.xlabel('False Positive Rate')
    plt.ylabel('True Positive Rate')
    plt.xlim([0, 1])
    plt.ylim([0, 1])
    plt.legend(['{}', AUC: {:.2f}'].format(legend, auc_score), 'CatBoost'],
    loc='lower right')
    plt.title('ROC Curve', weight='bold')

plot_roc_curve(fpr, tpr, auc_score, 'CatBoost')

# Confusion matrix
def plot_confusion_matrix(cm, classes,
                          normalize=False,
                          title='Confusion matrix',
                          cmap=plt.cm.Blues):
    """
    This function prints and plots the confusion matrix.
    Normalization can be applied by setting `normalize=True`.
    """
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(classes))
    plt.xticks(tick_marks, classes, rotation=45)
    plt.yticks(tick_marks, classes)

    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
```

```

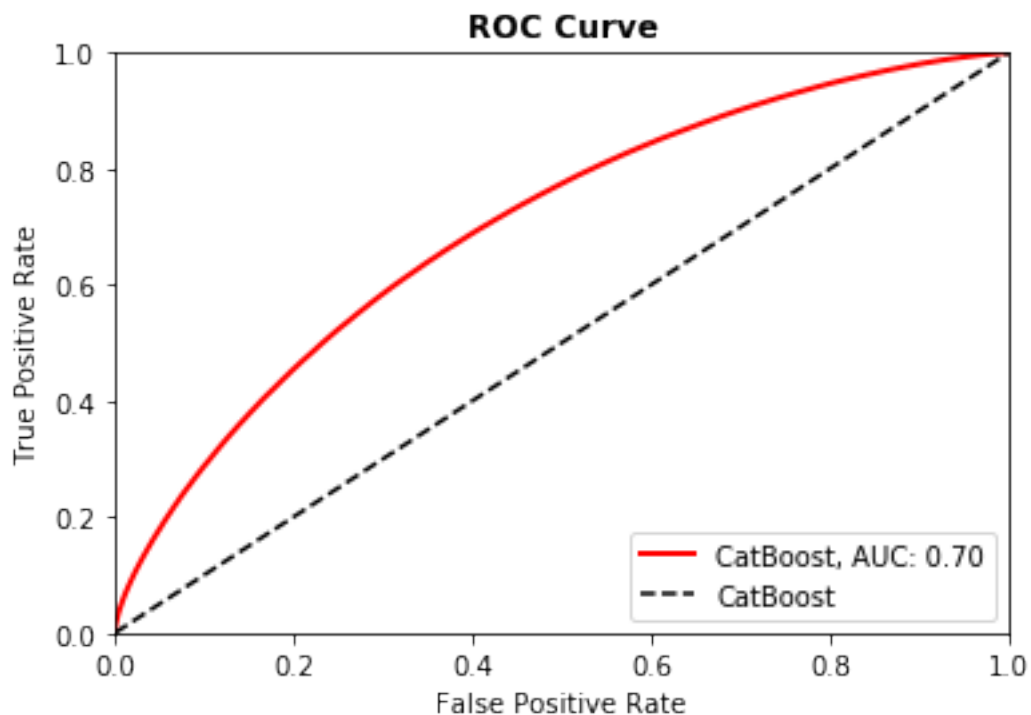
cm = np.round(cm, 2)
print("Normalized confusion matrix")
else:
    print('Confusion matrix, without normalization')

print(cm)

thresh = cm.max() / 2.
for i in range (cm.shape[0]):
    for j in range (cm.shape[1]):
        plt.text(j, i, cm[i, j],
                 horizontalalignment="center",
                 color="white" if cm[i, j] > thresh else "black")

plt.tight_layout()
plt.ylabel('True label')
plt.xlabel('Predicted label')

```



```

[22]: %%script false --no-raise-error

y_pred = pred_test
class_names = ['Not Detected', 'Detected']

```

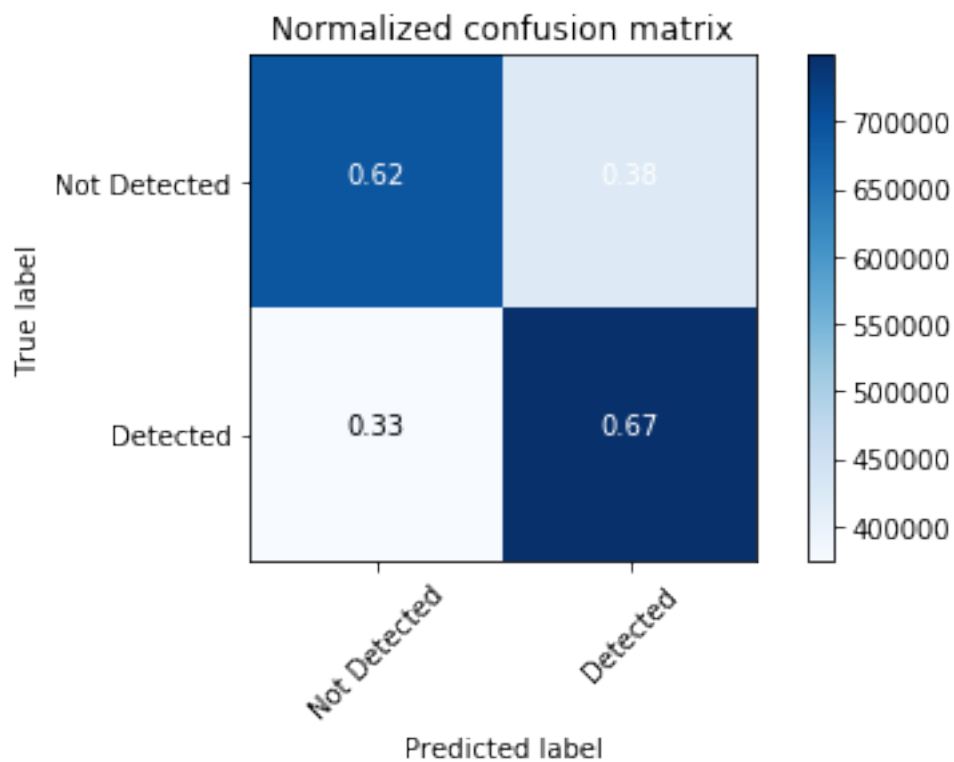
```
# Compute confusion matrix
cm = confusion_matrix(y_test, y_pred)

# Plot confusion matrix
plt.figure()
plot_confusion_matrix(cm, classes=class_names, normalize=True,
                      title='Normalized confusion matrix')

plt.show()
```

Normalized confusion matrix

```
[[0.62 0.38]
 [0.33 0.67]]
```



4.0.2 Model 2: CatBoost on all settings features

```
[23]: %%time

df_cat = df_settings
# Splitting features into test and train sets
X_train, X_test, y_train, y_test = train_test_split(df_cat, np.array(label),
                                                    test_size=0.3, random_state=42)
```

```

print('Train X: {}'.format(X_train.shape))
print('Test X: {}'.format(X_test.shape))
print('Train y: {}'.format(y_train.shape))
print('Test y: {}'.format(y_test.shape))

# Get categorical columns
columns = df_cat.columns
types = df_cat.dtypes
columns_cat = list(types[types == 'category'].index)
columns_cat_idx = [idx for idx, col in enumerate(columns) if col in columns_cat]

# Train the model
cat_boost = CatBoostClassifier(custom_metric='AUC')
cat_boost.fit(X_train, y_train, columns_cat_idx)

```

Train X: (5224247, 30)

Test X: (2238963, 30)

Train y: (5224247,)

Test y: (2238963,)

Learning rate set to 0.398593

0:	learn: 0.6790631	total: 4.89s	remaining: 1h 21m 30s
1:	learn: 0.6731889	total: 9.63s	remaining: 1h 20m 7s
2:	learn: 0.6703177	total: 14s	remaining: 1h 17m 23s
3:	learn: 0.6682764	total: 18.4s	remaining: 1h 16m 27s
4:	learn: 0.6669550	total: 23.2s	remaining: 1h 17m 5s
5:	learn: 0.6661800	total: 27.5s	remaining: 1h 15m 59s
6:	learn: 0.6654038	total: 32.2s	remaining: 1h 16m 6s
7:	learn: 0.6648188	total: 36.8s	remaining: 1h 16m
8:	learn: 0.6639966	total: 41.3s	remaining: 1h 15m 45s
9:	learn: 0.6632676	total: 45.9s	remaining: 1h 15m 48s
10:	learn: 0.6628551	total: 50.5s	remaining: 1h 15m 39s
11:	learn: 0.6625187	total: 54.9s	remaining: 1h 15m 16s
12:	learn: 0.6621038	total: 59.4s	remaining: 1h 15m 8s
13:	learn: 0.6618134	total: 1m 4s	remaining: 1h 15m 21s
14:	learn: 0.6614745	total: 1m 8s	remaining: 1h 15m 22s
15:	learn: 0.6611472	total: 1m 13s	remaining: 1h 15m 15s
16:	learn: 0.6609195	total: 1m 18s	remaining: 1h 15m 11s
17:	learn: 0.6606455	total: 1m 22s	remaining: 1h 15m 26s
18:	learn: 0.6604261	total: 1m 27s	remaining: 1h 15m 28s
19:	learn: 0.6602105	total: 1m 32s	remaining: 1h 15m 28s
20:	learn: 0.6600315	total: 1m 36s	remaining: 1h 15m 1s
21:	learn: 0.6598510	total: 1m 41s	remaining: 1h 14m 59s
22:	learn: 0.6597243	total: 1m 45s	remaining: 1h 14m 43s
23:	learn: 0.6594944	total: 1m 49s	remaining: 1h 14m 6s
24:	learn: 0.6593440	total: 1m 53s	remaining: 1h 13m 58s
25:	learn: 0.6592133	total: 1m 58s	remaining: 1h 14m 11s

26:	learn: 0.6590682	total: 2m 3s	remaining: 1h 14m 6s
27:	learn: 0.6589900	total: 2m 8s	remaining: 1h 14m 14s
28:	learn: 0.6588824	total: 2m 13s	remaining: 1h 14m 19s
29:	learn: 0.6587744	total: 2m 18s	remaining: 1h 14m 26s
30:	learn: 0.6586811	total: 2m 23s	remaining: 1h 14m 30s
31:	learn: 0.6585762	total: 2m 27s	remaining: 1h 14m 26s
32:	learn: 0.6584236	total: 2m 31s	remaining: 1h 14m 11s
33:	learn: 0.6582938	total: 2m 36s	remaining: 1h 14m 11s
34:	learn: 0.6582068	total: 2m 40s	remaining: 1h 13m 53s
35:	learn: 0.6580919	total: 2m 45s	remaining: 1h 13m 51s
36:	learn: 0.6580147	total: 2m 50s	remaining: 1h 13m 50s
37:	learn: 0.6578426	total: 2m 54s	remaining: 1h 13m 41s
38:	learn: 0.6577435	total: 2m 59s	remaining: 1h 13m 41s
39:	learn: 0.6576557	total: 3m 4s	remaining: 1h 13m 37s
40:	learn: 0.6575696	total: 3m 8s	remaining: 1h 13m 37s
41:	learn: 0.6574862	total: 3m 13s	remaining: 1h 13m 25s
42:	learn: 0.6573881	total: 3m 17s	remaining: 1h 13m 5s
43:	learn: 0.6572852	total: 3m 20s	remaining: 1h 12m 41s
44:	learn: 0.6572034	total: 3m 25s	remaining: 1h 12m 31s
45:	learn: 0.6570842	total: 3m 30s	remaining: 1h 12m 35s
46:	learn: 0.6570212	total: 3m 35s	remaining: 1h 12m 43s
47:	learn: 0.6569795	total: 3m 39s	remaining: 1h 12m 39s
48:	learn: 0.6568825	total: 3m 44s	remaining: 1h 12m 39s
49:	learn: 0.6567947	total: 3m 49s	remaining: 1h 12m 33s
50:	learn: 0.6567323	total: 3m 53s	remaining: 1h 12m 29s
51:	learn: 0.6566639	total: 3m 58s	remaining: 1h 12m 29s
52:	learn: 0.6566049	total: 4m 2s	remaining: 1h 12m 16s
53:	learn: 0.6565344	total: 4m 7s	remaining: 1h 12m 21s
54:	learn: 0.6564067	total: 4m 12s	remaining: 1h 12m 18s
55:	learn: 0.6563333	total: 4m 16s	remaining: 1h 12m 12s
56:	learn: 0.6562910	total: 4m 21s	remaining: 1h 12m 6s
57:	learn: 0.6562297	total: 4m 25s	remaining: 1h 11m 59s
58:	learn: 0.6561890	total: 4m 31s	remaining: 1h 12m 3s
59:	learn: 0.6561176	total: 4m 35s	remaining: 1h 11m 53s
60:	learn: 0.6560616	total: 4m 40s	remaining: 1h 11m 53s
61:	learn: 0.6559965	total: 4m 45s	remaining: 1h 11m 54s
62:	learn: 0.6559379	total: 4m 49s	remaining: 1h 11m 45s
63:	learn: 0.6558908	total: 4m 54s	remaining: 1h 11m 48s
64:	learn: 0.6558460	total: 4m 58s	remaining: 1h 11m 36s
65:	learn: 0.6557867	total: 5m 3s	remaining: 1h 11m 39s
66:	learn: 0.6557600	total: 5m 7s	remaining: 1h 11m 27s
67:	learn: 0.6557297	total: 5m 12s	remaining: 1h 11m 27s
68:	learn: 0.6556830	total: 5m 17s	remaining: 1h 11m 17s
69:	learn: 0.6556361	total: 5m 21s	remaining: 1h 11m 9s
70:	learn: 0.6555981	total: 5m 25s	remaining: 1h 10m 57s
71:	learn: 0.6555519	total: 5m 30s	remaining: 1h 10m 54s
72:	learn: 0.6555082	total: 5m 34s	remaining: 1h 10m 48s
73:	learn: 0.6554432	total: 5m 39s	remaining: 1h 10m 45s

74:	learn: 0.6553884	total: 5m 44s	remaining: 1h 10m 45s
75:	learn: 0.6553631	total: 5m 48s	remaining: 1h 10m 43s
76:	learn: 0.6553210	total: 5m 53s	remaining: 1h 10m 40s
77:	learn: 0.6552753	total: 5m 58s	remaining: 1h 10m 37s
78:	learn: 0.6552450	total: 6m 2s	remaining: 1h 10m 29s
79:	learn: 0.6552176	total: 6m 7s	remaining: 1h 10m 28s
80:	learn: 0.6551752	total: 6m 11s	remaining: 1h 10m 15s
81:	learn: 0.6551498	total: 6m 16s	remaining: 1h 10m 10s
82:	learn: 0.6551007	total: 6m 21s	remaining: 1h 10m 9s
83:	learn: 0.6550781	total: 6m 25s	remaining: 1h 10m 5s
84:	learn: 0.6550393	total: 6m 30s	remaining: 1h 10m 5s
85:	learn: 0.6550023	total: 6m 35s	remaining: 1h 10m 2s
86:	learn: 0.6549520	total: 6m 39s	remaining: 1h 9m 53s
87:	learn: 0.6549106	total: 6m 44s	remaining: 1h 9m 52s
88:	learn: 0.6548688	total: 6m 49s	remaining: 1h 9m 51s
89:	learn: 0.6548331	total: 6m 54s	remaining: 1h 9m 51s
90:	learn: 0.6547872	total: 6m 58s	remaining: 1h 9m 43s
91:	learn: 0.6547453	total: 7m 3s	remaining: 1h 9m 44s
92:	learn: 0.6547183	total: 7m 9s	remaining: 1h 9m 44s
93:	learn: 0.6546685	total: 7m 13s	remaining: 1h 9m 42s
94:	learn: 0.6546458	total: 7m 18s	remaining: 1h 9m 33s
95:	learn: 0.6545896	total: 7m 23s	remaining: 1h 9m 32s
96:	learn: 0.6545514	total: 7m 27s	remaining: 1h 9m 27s
97:	learn: 0.6545223	total: 7m 32s	remaining: 1h 9m 23s
98:	learn: 0.6544859	total: 7m 37s	remaining: 1h 9m 23s
99:	learn: 0.6544458	total: 7m 42s	remaining: 1h 9m 19s
100:	learn: 0.6544186	total: 7m 46s	remaining: 1h 9m 11s
101:	learn: 0.6543948	total: 7m 51s	remaining: 1h 9m 8s
102:	learn: 0.6543639	total: 7m 55s	remaining: 1h 9m 4s
103:	learn: 0.6543429	total: 8m 1s	remaining: 1h 9m 7s
104:	learn: 0.6542809	total: 8m 5s	remaining: 1h 9m 2s
105:	learn: 0.6542382	total: 8m 9s	remaining: 1h 8m 50s
106:	learn: 0.6542089	total: 8m 14s	remaining: 1h 8m 47s
107:	learn: 0.6541467	total: 8m 19s	remaining: 1h 8m 43s
108:	learn: 0.6541241	total: 8m 23s	remaining: 1h 8m 37s
109:	learn: 0.6540935	total: 8m 28s	remaining: 1h 8m 35s
110:	learn: 0.6540678	total: 8m 33s	remaining: 1h 8m 30s
111:	learn: 0.6540503	total: 8m 38s	remaining: 1h 8m 29s
112:	learn: 0.6540122	total: 8m 43s	remaining: 1h 8m 30s
113:	learn: 0.6539797	total: 8m 48s	remaining: 1h 8m 26s
114:	learn: 0.6539456	total: 8m 52s	remaining: 1h 8m 21s
115:	learn: 0.6539111	total: 8m 57s	remaining: 1h 8m 14s
116:	learn: 0.6538747	total: 9m 2s	remaining: 1h 8m 14s
117:	learn: 0.6538501	total: 9m 6s	remaining: 1h 8m 7s
118:	learn: 0.6538242	total: 9m 11s	remaining: 1h 8m 4s
119:	learn: 0.6538064	total: 9m 15s	remaining: 1h 7m 52s
120:	learn: 0.6537842	total: 9m 20s	remaining: 1h 7m 48s
121:	learn: 0.6537641	total: 9m 24s	remaining: 1h 7m 45s

122:	learn: 0.6537403	total: 9m 29s	remaining: 1h 7m 42s
123:	learn: 0.6537278	total: 9m 33s	remaining: 1h 7m 33s
124:	learn: 0.6537049	total: 9m 38s	remaining: 1h 7m 30s
125:	learn: 0.6536749	total: 9m 42s	remaining: 1h 7m 22s
126:	learn: 0.6536487	total: 9m 47s	remaining: 1h 7m 15s
127:	learn: 0.6536369	total: 9m 51s	remaining: 1h 7m 9s
128:	learn: 0.6536113	total: 9m 56s	remaining: 1h 7m 4s
129:	learn: 0.6536020	total: 10m	remaining: 1h 6m 58s
130:	learn: 0.6535872	total: 10m 4s	remaining: 1h 6m 49s
131:	learn: 0.6535636	total: 10m 9s	remaining: 1h 6m 46s
132:	learn: 0.6535486	total: 10m 14s	remaining: 1h 6m 43s
133:	learn: 0.6535302	total: 10m 19s	remaining: 1h 6m 40s
134:	learn: 0.6535191	total: 10m 23s	remaining: 1h 6m 35s
135:	learn: 0.6534962	total: 10m 28s	remaining: 1h 6m 34s
136:	learn: 0.6534680	total: 10m 33s	remaining: 1h 6m 32s
137:	learn: 0.6534383	total: 10m 38s	remaining: 1h 6m 31s
138:	learn: 0.6534297	total: 10m 43s	remaining: 1h 6m 26s
139:	learn: 0.6534135	total: 10m 48s	remaining: 1h 6m 24s
140:	learn: 0.6533928	total: 10m 52s	remaining: 1h 6m 18s
141:	learn: 0.6533786	total: 10m 58s	remaining: 1h 6m 15s
142:	learn: 0.6533646	total: 11m 2s	remaining: 1h 6m 11s
143:	learn: 0.6533540	total: 11m 7s	remaining: 1h 6m 8s
144:	learn: 0.6533464	total: 11m 12s	remaining: 1h 6m 5s
145:	learn: 0.6533100	total: 11m 16s	remaining: 1h 5m 58s
146:	learn: 0.6532929	total: 11m 20s	remaining: 1h 5m 48s
147:	learn: 0.6532665	total: 11m 24s	remaining: 1h 5m 41s
148:	learn: 0.6532395	total: 11m 29s	remaining: 1h 5m 36s
149:	learn: 0.6532085	total: 11m 33s	remaining: 1h 5m 27s
150:	learn: 0.6531909	total: 11m 38s	remaining: 1h 5m 24s
151:	learn: 0.6531812	total: 11m 42s	remaining: 1h 5m 21s
152:	learn: 0.6531648	total: 11m 47s	remaining: 1h 5m 19s
153:	learn: 0.6531537	total: 11m 52s	remaining: 1h 5m 14s
154:	learn: 0.6531313	total: 11m 56s	remaining: 1h 5m 6s
155:	learn: 0.6531280	total: 12m	remaining: 1h 4m 59s
156:	learn: 0.6531195	total: 12m 5s	remaining: 1h 4m 56s
157:	learn: 0.6530976	total: 12m 10s	remaining: 1h 4m 52s
158:	learn: 0.6530855	total: 12m 14s	remaining: 1h 4m 46s
159:	learn: 0.6530705	total: 12m 19s	remaining: 1h 4m 42s
160:	learn: 0.6530559	total: 12m 24s	remaining: 1h 4m 39s
161:	learn: 0.6530410	total: 12m 29s	remaining: 1h 4m 35s
162:	learn: 0.6530212	total: 12m 33s	remaining: 1h 4m 31s
163:	learn: 0.6529995	total: 12m 38s	remaining: 1h 4m 27s
164:	learn: 0.6529861	total: 12m 43s	remaining: 1h 4m 23s
165:	learn: 0.6529552	total: 12m 47s	remaining: 1h 4m 16s
166:	learn: 0.6529484	total: 12m 52s	remaining: 1h 4m 13s
167:	learn: 0.6529331	total: 12m 56s	remaining: 1h 4m 6s
168:	learn: 0.6529219	total: 13m 1s	remaining: 1h 4m 1s
169:	learn: 0.6529029	total: 13m 5s	remaining: 1h 3m 55s

170:	learn: 0.6528899	total: 13m 9s	remaining: 1h 3m 48s
171:	learn: 0.6528750	total: 13m 14s	remaining: 1h 3m 42s
172:	learn: 0.6528621	total: 13m 18s	remaining: 1h 3m 38s
173:	learn: 0.6528411	total: 13m 23s	remaining: 1h 3m 32s
174:	learn: 0.6528284	total: 13m 27s	remaining: 1h 3m 29s
175:	learn: 0.6528092	total: 13m 32s	remaining: 1h 3m 23s
176:	learn: 0.6527846	total: 13m 36s	remaining: 1h 3m 18s
177:	learn: 0.6527548	total: 13m 41s	remaining: 1h 3m 14s
178:	learn: 0.6527386	total: 13m 45s	remaining: 1h 3m 5s
179:	learn: 0.6527303	total: 13m 49s	remaining: 1h 2m 59s
180:	learn: 0.6527001	total: 13m 54s	remaining: 1h 2m 55s
181:	learn: 0.6526918	total: 13m 59s	remaining: 1h 2m 51s
182:	learn: 0.6526782	total: 14m 3s	remaining: 1h 2m 47s
183:	learn: 0.6526588	total: 14m 7s	remaining: 1h 2m 40s
184:	learn: 0.6526492	total: 14m 12s	remaining: 1h 2m 37s
185:	learn: 0.6526381	total: 14m 17s	remaining: 1h 2m 31s
186:	learn: 0.6526292	total: 14m 21s	remaining: 1h 2m 26s
187:	learn: 0.6526100	total: 14m 26s	remaining: 1h 2m 23s
188:	learn: 0.6526039	total: 14m 31s	remaining: 1h 2m 20s
189:	learn: 0.6525892	total: 14m 36s	remaining: 1h 2m 15s
190:	learn: 0.6525689	total: 14m 40s	remaining: 1h 2m 11s
191:	learn: 0.6525560	total: 14m 45s	remaining: 1h 2m 7s
192:	learn: 0.6525488	total: 14m 49s	remaining: 1h 2m
193:	learn: 0.6525384	total: 14m 54s	remaining: 1h 1m 55s
194:	learn: 0.6525287	total: 14m 59s	remaining: 1h 1m 52s
195:	learn: 0.6525144	total: 15m 4s	remaining: 1h 1m 48s
196:	learn: 0.6525039	total: 15m 8s	remaining: 1h 1m 45s
197:	learn: 0.6524811	total: 15m 13s	remaining: 1h 1m 39s
198:	learn: 0.6524661	total: 15m 18s	remaining: 1h 1m 36s
199:	learn: 0.6524537	total: 15m 23s	remaining: 1h 1m 32s
200:	learn: 0.6524397	total: 15m 28s	remaining: 1h 1m 29s
201:	learn: 0.6524050	total: 15m 33s	remaining: 1h 1m 26s
202:	learn: 0.6523899	total: 15m 37s	remaining: 1h 1m 21s
203:	learn: 0.6523837	total: 15m 42s	remaining: 1h 1m 15s
204:	learn: 0.6523729	total: 15m 47s	remaining: 1h 1m 12s
205:	learn: 0.6523619	total: 15m 51s	remaining: 1h 1m 9s
206:	learn: 0.6523515	total: 15m 56s	remaining: 1h 1m 5s
207:	learn: 0.6523373	total: 16m 1s	remaining: 1h 1m 2s
208:	learn: 0.6523299	total: 16m 6s	remaining: 1h 58s
209:	learn: 0.6523176	total: 16m 11s	remaining: 1h 53s
210:	learn: 0.6523043	total: 16m 15s	remaining: 1h 49s
211:	learn: 0.6522916	total: 16m 20s	remaining: 1h 44s
212:	learn: 0.6522825	total: 16m 24s	remaining: 1h 38s
213:	learn: 0.6522747	total: 16m 29s	remaining: 1h 35s
214:	learn: 0.6522607	total: 16m 34s	remaining: 1h 30s
215:	learn: 0.6522477	total: 16m 38s	remaining: 1h 25s
216:	learn: 0.6522434	total: 16m 44s	remaining: 1h 24s
217:	learn: 0.6522375	total: 16m 50s	remaining: 1h 23s

218:	learn: 0.6522252	total: 16m 54s	remaining: 1h 19s
219:	learn: 0.6522121	total: 17m	remaining: 1h 17s
220:	learn: 0.6521932	total: 17m 4s	remaining: 1h 12s
221:	learn: 0.6521886	total: 17m 9s	remaining: 1h 8s
222:	learn: 0.6521859	total: 17m 14s	remaining: 1h 4s
223:	learn: 0.6521825	total: 17m 19s	remaining: 1h
224:	learn: 0.6521738	total: 17m 23s	remaining: 59m 55s
225:	learn: 0.6521630	total: 17m 27s	remaining: 59m 48s
226:	learn: 0.6521524	total: 17m 32s	remaining: 59m 44s
227:	learn: 0.6521467	total: 17m 36s	remaining: 59m 38s
228:	learn: 0.6521394	total: 17m 41s	remaining: 59m 35s
229:	learn: 0.6521160	total: 17m 46s	remaining: 59m 29s
230:	learn: 0.6521080	total: 17m 50s	remaining: 59m 23s
231:	learn: 0.6521033	total: 17m 54s	remaining: 59m 15s
232:	learn: 0.6520933	total: 17m 58s	remaining: 59m 11s
233:	learn: 0.6520789	total: 18m 3s	remaining: 59m 8s
234:	learn: 0.6520638	total: 18m 8s	remaining: 59m 4s
235:	learn: 0.6520530	total: 18m 12s	remaining: 58m 57s
236:	learn: 0.6520455	total: 18m 17s	remaining: 58m 53s
237:	learn: 0.6520358	total: 18m 22s	remaining: 58m 48s
238:	learn: 0.6520341	total: 18m 26s	remaining: 58m 43s
239:	learn: 0.6520165	total: 18m 30s	remaining: 58m 37s
240:	learn: 0.6520160	total: 18m 34s	remaining: 58m 30s
241:	learn: 0.6520019	total: 18m 39s	remaining: 58m 25s
242:	learn: 0.6519902	total: 18m 43s	remaining: 58m 18s
243:	learn: 0.6519763	total: 18m 47s	remaining: 58m 14s
244:	learn: 0.6519667	total: 18m 52s	remaining: 58m 10s
245:	learn: 0.6519545	total: 18m 57s	remaining: 58m 6s
246:	learn: 0.6519480	total: 19m 2s	remaining: 58m 2s
247:	learn: 0.6519462	total: 19m 6s	remaining: 57m 57s
248:	learn: 0.6519301	total: 19m 11s	remaining: 57m 52s
249:	learn: 0.6519242	total: 19m 15s	remaining: 57m 47s
250:	learn: 0.6519190	total: 19m 20s	remaining: 57m 43s
251:	learn: 0.6519110	total: 19m 25s	remaining: 57m 39s
252:	learn: 0.6519100	total: 19m 30s	remaining: 57m 34s
253:	learn: 0.6519010	total: 19m 34s	remaining: 57m 29s
254:	learn: 0.6518903	total: 19m 39s	remaining: 57m 25s
255:	learn: 0.6518834	total: 19m 43s	remaining: 57m 18s
256:	learn: 0.6518742	total: 19m 48s	remaining: 57m 14s
257:	learn: 0.6518700	total: 19m 52s	remaining: 57m 10s
258:	learn: 0.6518655	total: 19m 56s	remaining: 57m 3s
259:	learn: 0.6518550	total: 20m 1s	remaining: 57m
260:	learn: 0.6518498	total: 20m 6s	remaining: 56m 55s
261:	learn: 0.6518471	total: 20m 11s	remaining: 56m 51s
262:	learn: 0.6518318	total: 20m 15s	remaining: 56m 47s
263:	learn: 0.6518264	total: 20m 20s	remaining: 56m 42s
264:	learn: 0.6518126	total: 20m 25s	remaining: 56m 39s
265:	learn: 0.6518076	total: 20m 29s	remaining: 56m 31s

266:	learn: 0.6518016	total: 20m 33s	remaining: 56m 27s
267:	learn: 0.6517884	total: 20m 38s	remaining: 56m 22s
268:	learn: 0.6517827	total: 20m 43s	remaining: 56m 17s
269:	learn: 0.6517661	total: 20m 47s	remaining: 56m 13s
270:	learn: 0.6517625	total: 20m 52s	remaining: 56m 9s
271:	learn: 0.6517595	total: 20m 56s	remaining: 56m 4s
272:	learn: 0.6517556	total: 21m 1s	remaining: 56m
273:	learn: 0.6517451	total: 21m 6s	remaining: 55m 56s
274:	learn: 0.6517368	total: 21m 11s	remaining: 55m 51s
275:	learn: 0.6517131	total: 21m 15s	remaining: 55m 46s
276:	learn: 0.6517063	total: 21m 20s	remaining: 55m 42s
277:	learn: 0.6516927	total: 21m 25s	remaining: 55m 38s
278:	learn: 0.6516876	total: 21m 30s	remaining: 55m 34s
279:	learn: 0.6516756	total: 21m 34s	remaining: 55m 28s
280:	learn: 0.6516663	total: 21m 39s	remaining: 55m 24s
281:	learn: 0.6516589	total: 21m 43s	remaining: 55m 19s
282:	learn: 0.6516514	total: 21m 49s	remaining: 55m 16s
283:	learn: 0.6516486	total: 21m 53s	remaining: 55m 12s
284:	learn: 0.6516401	total: 21m 58s	remaining: 55m 7s
285:	learn: 0.6516301	total: 22m 3s	remaining: 55m 3s
286:	learn: 0.6516166	total: 22m 7s	remaining: 54m 57s
287:	learn: 0.6516128	total: 22m 12s	remaining: 54m 53s
288:	learn: 0.6516071	total: 22m 16s	remaining: 54m 46s
289:	learn: 0.6516051	total: 22m 20s	remaining: 54m 41s
290:	learn: 0.6515935	total: 22m 25s	remaining: 54m 37s
291:	learn: 0.6515894	total: 22m 29s	remaining: 54m 32s
292:	learn: 0.6515757	total: 22m 34s	remaining: 54m 27s
293:	learn: 0.6515701	total: 22m 38s	remaining: 54m 21s
294:	learn: 0.6515585	total: 22m 41s	remaining: 54m 14s
295:	learn: 0.6515518	total: 22m 46s	remaining: 54m 9s
296:	learn: 0.6515476	total: 22m 51s	remaining: 54m 6s
297:	learn: 0.6515409	total: 22m 56s	remaining: 54m 1s
298:	learn: 0.6515332	total: 23m 1s	remaining: 53m 58s
299:	learn: 0.6515267	total: 23m 6s	remaining: 53m 56s
300:	learn: 0.6515210	total: 23m 11s	remaining: 53m 50s
301:	learn: 0.6515190	total: 23m 16s	remaining: 53m 48s
302:	learn: 0.6515089	total: 23m 21s	remaining: 53m 43s
303:	learn: 0.6515078	total: 23m 25s	remaining: 53m 38s
304:	learn: 0.6515028	total: 23m 29s	remaining: 53m 32s
305:	learn: 0.6514991	total: 23m 34s	remaining: 53m 27s
306:	learn: 0.6514886	total: 23m 38s	remaining: 53m 23s
307:	learn: 0.6514754	total: 23m 43s	remaining: 53m 18s
308:	learn: 0.6514753	total: 23m 47s	remaining: 53m 12s
309:	learn: 0.6514603	total: 23m 52s	remaining: 53m 7s
310:	learn: 0.6514534	total: 23m 57s	remaining: 53m 4s
311:	learn: 0.6514411	total: 24m 2s	remaining: 53m
312:	learn: 0.6514363	total: 24m 6s	remaining: 52m 55s
313:	learn: 0.6514291	total: 24m 10s	remaining: 52m 50s

314:	learn: 0.6514197	total: 24m 15s	remaining: 52m 45s
315:	learn: 0.6514142	total: 24m 20s	remaining: 52m 41s
316:	learn: 0.6514063	total: 24m 25s	remaining: 52m 36s
317:	learn: 0.6514012	total: 24m 30s	remaining: 52m 33s
318:	learn: 0.6513945	total: 24m 35s	remaining: 52m 29s
319:	learn: 0.6513864	total: 24m 40s	remaining: 52m 25s
320:	learn: 0.6513835	total: 24m 44s	remaining: 52m 20s
321:	learn: 0.6513733	total: 24m 49s	remaining: 52m 16s
322:	learn: 0.6513620	total: 24m 54s	remaining: 52m 11s
323:	learn: 0.6513565	total: 24m 58s	remaining: 52m 7s
324:	learn: 0.6513498	total: 25m 3s	remaining: 52m 1s
325:	learn: 0.6513396	total: 25m 7s	remaining: 51m 57s
326:	learn: 0.6513346	total: 25m 12s	remaining: 51m 52s
327:	learn: 0.6513298	total: 25m 16s	remaining: 51m 47s
328:	learn: 0.6513251	total: 25m 21s	remaining: 51m 43s
329:	learn: 0.6513135	total: 25m 26s	remaining: 51m 38s
330:	learn: 0.6512983	total: 25m 30s	remaining: 51m 34s
331:	learn: 0.6512848	total: 25m 35s	remaining: 51m 29s
332:	learn: 0.6512808	total: 25m 39s	remaining: 51m 23s
333:	learn: 0.6512661	total: 25m 44s	remaining: 51m 20s
334:	learn: 0.6512571	total: 25m 49s	remaining: 51m 15s
335:	learn: 0.6512525	total: 25m 53s	remaining: 51m 9s
336:	learn: 0.6512425	total: 25m 58s	remaining: 51m 6s
337:	learn: 0.6512401	total: 26m 3s	remaining: 51m 2s
338:	learn: 0.6512369	total: 26m 8s	remaining: 50m 57s
339:	learn: 0.6512290	total: 26m 13s	remaining: 50m 53s
340:	learn: 0.6512205	total: 26m 17s	remaining: 50m 49s
341:	learn: 0.6512167	total: 26m 22s	remaining: 50m 45s
342:	learn: 0.6512081	total: 26m 27s	remaining: 50m 41s
343:	learn: 0.6512033	total: 26m 32s	remaining: 50m 37s
344:	learn: 0.6511994	total: 26m 37s	remaining: 50m 32s
345:	learn: 0.6511957	total: 26m 42s	remaining: 50m 28s
346:	learn: 0.6511890	total: 26m 47s	remaining: 50m 25s
347:	learn: 0.6511818	total: 26m 53s	remaining: 50m 23s
348:	learn: 0.6511778	total: 27m	remaining: 50m 22s
349:	learn: 0.6511696	total: 27m 6s	remaining: 50m 21s
350:	learn: 0.6511586	total: 27m 12s	remaining: 50m 18s
351:	learn: 0.6511482	total: 27m 18s	remaining: 50m 15s
352:	learn: 0.6511423	total: 27m 24s	remaining: 50m 14s
353:	learn: 0.6511405	total: 27m 30s	remaining: 50m 11s
354:	learn: 0.6511305	total: 27m 35s	remaining: 50m 7s
355:	learn: 0.6511284	total: 27m 39s	remaining: 50m 2s
356:	learn: 0.6511272	total: 27m 43s	remaining: 49m 56s
357:	learn: 0.6511212	total: 27m 48s	remaining: 49m 52s
358:	learn: 0.6511133	total: 27m 53s	remaining: 49m 47s
359:	learn: 0.6511048	total: 27m 58s	remaining: 49m 44s
360:	learn: 0.6510952	total: 28m 3s	remaining: 49m 39s
361:	learn: 0.6510846	total: 28m 8s	remaining: 49m 35s

362:	learn: 0.6510793	total: 28m 12s	remaining: 49m 30s
363:	learn: 0.6510758	total: 28m 17s	remaining: 49m 26s
364:	learn: 0.6510752	total: 28m 22s	remaining: 49m 21s
365:	learn: 0.6510740	total: 28m 26s	remaining: 49m 15s
366:	learn: 0.6510682	total: 28m 31s	remaining: 49m 12s
367:	learn: 0.6510623	total: 28m 36s	remaining: 49m 8s
368:	learn: 0.6510610	total: 28m 40s	remaining: 49m 2s
369:	learn: 0.6510562	total: 28m 45s	remaining: 48m 58s
370:	learn: 0.6510517	total: 28m 50s	remaining: 48m 53s
371:	learn: 0.6510410	total: 28m 54s	remaining: 48m 48s
372:	learn: 0.6510381	total: 28m 59s	remaining: 48m 44s
373:	learn: 0.6510317	total: 29m 4s	remaining: 48m 39s
374:	learn: 0.6510284	total: 29m 8s	remaining: 48m 34s
375:	learn: 0.6510202	total: 29m 12s	remaining: 48m 29s
376:	learn: 0.6510116	total: 29m 17s	remaining: 48m 24s
377:	learn: 0.6510037	total: 29m 22s	remaining: 48m 19s
378:	learn: 0.6509939	total: 29m 26s	remaining: 48m 14s
379:	learn: 0.6509921	total: 29m 31s	remaining: 48m 9s
380:	learn: 0.6509907	total: 29m 35s	remaining: 48m 4s
381:	learn: 0.6509891	total: 29m 40s	remaining: 48m
382:	learn: 0.6509832	total: 29m 45s	remaining: 47m 56s
383:	learn: 0.6509685	total: 29m 50s	remaining: 47m 51s
384:	learn: 0.6509617	total: 29m 55s	remaining: 47m 47s
385:	learn: 0.6509568	total: 30m	remaining: 47m 43s
386:	learn: 0.6509472	total: 30m 5s	remaining: 47m 39s
387:	learn: 0.6509394	total: 30m 10s	remaining: 47m 36s
388:	learn: 0.6509320	total: 30m 16s	remaining: 47m 33s
389:	learn: 0.6509259	total: 30m 23s	remaining: 47m 31s
390:	learn: 0.6509206	total: 30m 29s	remaining: 47m 29s
391:	learn: 0.6509105	total: 30m 35s	remaining: 47m 27s
392:	learn: 0.6508995	total: 30m 41s	remaining: 47m 24s
393:	learn: 0.6508902	total: 30m 46s	remaining: 47m 19s
394:	learn: 0.6508846	total: 30m 51s	remaining: 47m 15s
395:	learn: 0.6508778	total: 30m 55s	remaining: 47m 10s
396:	learn: 0.6508703	total: 31m	remaining: 47m 6s
397:	learn: 0.6508666	total: 31m 5s	remaining: 47m 1s
398:	learn: 0.6508626	total: 31m 9s	remaining: 46m 56s
399:	learn: 0.6508525	total: 31m 14s	remaining: 46m 52s
400:	learn: 0.6508448	total: 31m 19s	remaining: 46m 47s
401:	learn: 0.6508376	total: 31m 24s	remaining: 46m 43s
402:	learn: 0.6508250	total: 31m 30s	remaining: 46m 40s
403:	learn: 0.6508245	total: 31m 36s	remaining: 46m 37s
404:	learn: 0.6508215	total: 31m 41s	remaining: 46m 32s
405:	learn: 0.6508157	total: 31m 46s	remaining: 46m 29s
406:	learn: 0.6508107	total: 31m 51s	remaining: 46m 25s
407:	learn: 0.6508077	total: 31m 57s	remaining: 46m 21s
408:	learn: 0.6508071	total: 32m 1s	remaining: 46m 17s
409:	learn: 0.6508024	total: 32m 7s	remaining: 46m 13s

410:	learn: 0.6507943	total: 32m 11s	remaining: 46m 8s
411:	learn: 0.6507806	total: 32m 16s	remaining: 46m 3s
412:	learn: 0.6507729	total: 32m 21s	remaining: 45m 59s
413:	learn: 0.6507703	total: 32m 26s	remaining: 45m 54s
414:	learn: 0.6507625	total: 32m 30s	remaining: 45m 49s
415:	learn: 0.6507607	total: 32m 35s	remaining: 45m 44s
416:	learn: 0.6507585	total: 32m 40s	remaining: 45m 40s
417:	learn: 0.6507463	total: 32m 44s	remaining: 45m 35s
418:	learn: 0.6507391	total: 32m 48s	remaining: 45m 29s
419:	learn: 0.6507311	total: 32m 53s	remaining: 45m 25s
420:	learn: 0.6507279	total: 32m 58s	remaining: 45m 21s
421:	learn: 0.6507268	total: 33m 3s	remaining: 45m 16s
422:	learn: 0.6507250	total: 33m 7s	remaining: 45m 11s
423:	learn: 0.6507205	total: 33m 12s	remaining: 45m 6s
424:	learn: 0.6507116	total: 33m 16s	remaining: 45m 1s
425:	learn: 0.6506956	total: 33m 21s	remaining: 44m 56s
426:	learn: 0.6506910	total: 33m 26s	remaining: 44m 52s
427:	learn: 0.6506850	total: 33m 31s	remaining: 44m 48s
428:	learn: 0.6506797	total: 33m 36s	remaining: 44m 43s
429:	learn: 0.6506760	total: 33m 40s	remaining: 44m 38s
430:	learn: 0.6506624	total: 33m 45s	remaining: 44m 34s
431:	learn: 0.6506551	total: 33m 50s	remaining: 44m 30s
432:	learn: 0.6506542	total: 33m 55s	remaining: 44m 25s
433:	learn: 0.6506469	total: 34m	remaining: 44m 21s
434:	learn: 0.6506388	total: 34m 5s	remaining: 44m 16s
435:	learn: 0.6506319	total: 34m 9s	remaining: 44m 11s
436:	learn: 0.6506301	total: 34m 14s	remaining: 44m 6s
437:	learn: 0.6506247	total: 34m 19s	remaining: 44m 2s
438:	learn: 0.6506221	total: 34m 23s	remaining: 43m 56s
439:	learn: 0.6506175	total: 34m 28s	remaining: 43m 52s
440:	learn: 0.6506101	total: 34m 33s	remaining: 43m 48s
441:	learn: 0.6506038	total: 34m 38s	remaining: 43m 43s
442:	learn: 0.6505986	total: 34m 43s	remaining: 43m 39s
443:	learn: 0.6505977	total: 34m 47s	remaining: 43m 33s
444:	learn: 0.6505935	total: 34m 51s	remaining: 43m 28s
445:	learn: 0.6505872	total: 34m 57s	remaining: 43m 25s
446:	learn: 0.6505844	total: 35m 2s	remaining: 43m 21s
447:	learn: 0.6505804	total: 35m 7s	remaining: 43m 17s
448:	learn: 0.6505746	total: 35m 13s	remaining: 43m 13s
449:	learn: 0.6505739	total: 35m 18s	remaining: 43m 9s
450:	learn: 0.6505713	total: 35m 23s	remaining: 43m 5s
451:	learn: 0.6505635	total: 35m 28s	remaining: 43m 1s
452:	learn: 0.6505532	total: 35m 34s	remaining: 42m 57s
453:	learn: 0.6505485	total: 35m 39s	remaining: 42m 53s
454:	learn: 0.6505455	total: 35m 44s	remaining: 42m 49s
455:	learn: 0.6505431	total: 35m 49s	remaining: 42m 44s
456:	learn: 0.6505374	total: 35m 54s	remaining: 42m 39s
457:	learn: 0.6505316	total: 35m 58s	remaining: 42m 34s

458:	learn: 0.6505255	total: 36m 3s	remaining: 42m 30s
459:	learn: 0.6505223	total: 36m 8s	remaining: 42m 25s
460:	learn: 0.6505205	total: 36m 12s	remaining: 42m 20s
461:	learn: 0.6505103	total: 36m 17s	remaining: 42m 16s
462:	learn: 0.6505067	total: 36m 22s	remaining: 42m 11s
463:	learn: 0.6504933	total: 36m 26s	remaining: 42m 6s
464:	learn: 0.6504854	total: 36m 31s	remaining: 42m 1s
465:	learn: 0.6504781	total: 36m 36s	remaining: 41m 57s
466:	learn: 0.6504756	total: 36m 41s	remaining: 41m 52s
467:	learn: 0.6504742	total: 36m 46s	remaining: 41m 48s
468:	learn: 0.6504686	total: 36m 51s	remaining: 41m 43s
469:	learn: 0.6504636	total: 36m 55s	remaining: 41m 38s
470:	learn: 0.6504627	total: 37m	remaining: 41m 34s
471:	learn: 0.6504570	total: 37m 5s	remaining: 41m 29s
472:	learn: 0.6504547	total: 37m 9s	remaining: 41m 24s
473:	learn: 0.6504529	total: 37m 14s	remaining: 41m 19s
474:	learn: 0.6504502	total: 37m 19s	remaining: 41m 15s
475:	learn: 0.6504495	total: 37m 24s	remaining: 41m 10s
476:	learn: 0.6504475	total: 37m 29s	remaining: 41m 6s
477:	learn: 0.6504385	total: 37m 34s	remaining: 41m 2s
478:	learn: 0.6504244	total: 37m 39s	remaining: 40m 57s
479:	learn: 0.6504230	total: 37m 43s	remaining: 40m 52s
480:	learn: 0.6504225	total: 37m 48s	remaining: 40m 47s
481:	learn: 0.6504167	total: 37m 52s	remaining: 40m 42s
482:	learn: 0.6504140	total: 37m 57s	remaining: 40m 38s
483:	learn: 0.6504058	total: 38m 2s	remaining: 40m 33s
484:	learn: 0.6503994	total: 38m 7s	remaining: 40m 29s
485:	learn: 0.6503975	total: 38m 11s	remaining: 40m 23s
486:	learn: 0.6503916	total: 38m 15s	remaining: 40m 18s
487:	learn: 0.6503858	total: 38m 21s	remaining: 40m 14s
488:	learn: 0.6503791	total: 38m 25s	remaining: 40m 9s
489:	learn: 0.6503687	total: 38m 30s	remaining: 40m 4s
490:	learn: 0.6503649	total: 38m 34s	remaining: 39m 59s
491:	learn: 0.6503610	total: 38m 39s	remaining: 39m 54s
492:	learn: 0.6503585	total: 38m 44s	remaining: 39m 50s
493:	learn: 0.6503578	total: 38m 49s	remaining: 39m 45s
494:	learn: 0.6503544	total: 38m 53s	remaining: 39m 40s
495:	learn: 0.6503498	total: 38m 58s	remaining: 39m 36s
496:	learn: 0.6503471	total: 39m 3s	remaining: 39m 32s
497:	learn: 0.6503446	total: 39m 8s	remaining: 39m 27s
498:	learn: 0.6503400	total: 39m 12s	remaining: 39m 22s
499:	learn: 0.6503310	total: 39m 17s	remaining: 39m 17s
500:	learn: 0.6503248	total: 39m 21s	remaining: 39m 12s
501:	learn: 0.6503148	total: 39m 26s	remaining: 39m 7s
502:	learn: 0.6503139	total: 39m 30s	remaining: 39m 2s
503:	learn: 0.6503104	total: 39m 35s	remaining: 38m 57s
504:	learn: 0.6503096	total: 39m 40s	remaining: 38m 53s
505:	learn: 0.6503050	total: 39m 45s	remaining: 38m 48s

506:	learn: 0.6502984	total: 39m 50s	remaining: 38m 44s
507:	learn: 0.6502936	total: 39m 54s	remaining: 38m 39s
508:	learn: 0.6502911	total: 39m 59s	remaining: 38m 34s
509:	learn: 0.6502833	total: 40m 4s	remaining: 38m 30s
510:	learn: 0.6502798	total: 40m 9s	remaining: 38m 25s
511:	learn: 0.6502727	total: 40m 14s	remaining: 38m 21s
512:	learn: 0.6502682	total: 40m 19s	remaining: 38m 16s
513:	learn: 0.6502595	total: 40m 24s	remaining: 38m 12s
514:	learn: 0.6502541	total: 40m 28s	remaining: 38m 7s
515:	learn: 0.6502461	total: 40m 33s	remaining: 38m 2s
516:	learn: 0.6502435	total: 40m 38s	remaining: 37m 58s
517:	learn: 0.6502348	total: 40m 43s	remaining: 37m 53s
518:	learn: 0.6502312	total: 40m 48s	remaining: 37m 49s
519:	learn: 0.6502282	total: 40m 52s	remaining: 37m 44s
520:	learn: 0.6502191	total: 40m 58s	remaining: 37m 40s
521:	learn: 0.6502137	total: 41m 3s	remaining: 37m 35s
522:	learn: 0.6502102	total: 41m 8s	remaining: 37m 30s
523:	learn: 0.6502087	total: 41m 12s	remaining: 37m 26s
524:	learn: 0.6502055	total: 41m 17s	remaining: 37m 21s
525:	learn: 0.6502028	total: 41m 22s	remaining: 37m 17s
526:	learn: 0.6502023	total: 41m 26s	remaining: 37m 11s
527:	learn: 0.6501944	total: 41m 31s	remaining: 37m 7s
528:	learn: 0.6501893	total: 41m 36s	remaining: 37m 2s
529:	learn: 0.6501844	total: 41m 41s	remaining: 36m 58s
530:	learn: 0.6501777	total: 41m 45s	remaining: 36m 53s
531:	learn: 0.6501764	total: 41m 50s	remaining: 36m 48s
532:	learn: 0.6501659	total: 41m 54s	remaining: 36m 43s
533:	learn: 0.6501586	total: 41m 59s	remaining: 36m 38s
534:	learn: 0.6501561	total: 42m 4s	remaining: 36m 34s
535:	learn: 0.6501515	total: 42m 9s	remaining: 36m 29s
536:	learn: 0.6501460	total: 42m 14s	remaining: 36m 24s
537:	learn: 0.6501300	total: 42m 18s	remaining: 36m 20s
538:	learn: 0.6501290	total: 42m 23s	remaining: 36m 15s
539:	learn: 0.6501231	total: 42m 28s	remaining: 36m 10s
540:	learn: 0.6501166	total: 42m 32s	remaining: 36m 5s
541:	learn: 0.6501107	total: 42m 37s	remaining: 36m 1s
542:	learn: 0.6501047	total: 42m 42s	remaining: 35m 56s
543:	learn: 0.6501021	total: 42m 47s	remaining: 35m 51s
544:	learn: 0.6501019	total: 42m 51s	remaining: 35m 47s
545:	learn: 0.6500963	total: 42m 56s	remaining: 35m 42s
546:	learn: 0.6500900	total: 43m 1s	remaining: 35m 37s
547:	learn: 0.6500893	total: 43m 6s	remaining: 35m 33s
548:	learn: 0.6500853	total: 43m 10s	remaining: 35m 28s
549:	learn: 0.6500796	total: 43m 15s	remaining: 35m 23s
550:	learn: 0.6500789	total: 43m 20s	remaining: 35m 18s
551:	learn: 0.6500763	total: 43m 25s	remaining: 35m 14s
552:	learn: 0.6500712	total: 43m 29s	remaining: 35m 9s
553:	learn: 0.6500697	total: 43m 34s	remaining: 35m 4s

554:	learn: 0.6500667	total: 43m 38s	remaining: 34m 59s
555:	learn: 0.6500654	total: 43m 43s	remaining: 34m 55s
556:	learn: 0.6500620	total: 43m 48s	remaining: 34m 50s
557:	learn: 0.6500582	total: 43m 53s	remaining: 34m 45s
558:	learn: 0.6500562	total: 43m 58s	remaining: 34m 41s
559:	learn: 0.6500498	total: 44m 2s	remaining: 34m 36s
560:	learn: 0.6500453	total: 44m 7s	remaining: 34m 31s
561:	learn: 0.6500396	total: 44m 12s	remaining: 34m 27s
562:	learn: 0.6500380	total: 44m 16s	remaining: 34m 22s
563:	learn: 0.6500350	total: 44m 21s	remaining: 34m 17s
564:	learn: 0.6500312	total: 44m 25s	remaining: 34m 12s
565:	learn: 0.6500282	total: 44m 30s	remaining: 34m 7s
566:	learn: 0.6500200	total: 44m 35s	remaining: 34m 3s
567:	learn: 0.6500146	total: 44m 40s	remaining: 33m 58s
568:	learn: 0.6500103	total: 44m 45s	remaining: 33m 53s
569:	learn: 0.6500081	total: 44m 49s	remaining: 33m 49s
570:	learn: 0.6500011	total: 44m 54s	remaining: 33m 44s
571:	learn: 0.6499987	total: 44m 59s	remaining: 33m 39s
572:	learn: 0.6499959	total: 45m 4s	remaining: 33m 35s
573:	learn: 0.6499905	total: 45m 9s	remaining: 33m 30s
574:	learn: 0.6499882	total: 45m 14s	remaining: 33m 26s
575:	learn: 0.6499846	total: 45m 18s	remaining: 33m 21s
576:	learn: 0.6499777	total: 45m 23s	remaining: 33m 16s
577:	learn: 0.6499735	total: 45m 28s	remaining: 33m 12s
578:	learn: 0.6499685	total: 45m 33s	remaining: 33m 7s
579:	learn: 0.6499644	total: 45m 38s	remaining: 33m 3s
580:	learn: 0.6499608	total: 45m 43s	remaining: 32m 58s
581:	learn: 0.6499566	total: 45m 48s	remaining: 32m 54s
582:	learn: 0.6499543	total: 45m 53s	remaining: 32m 49s
583:	learn: 0.6499479	total: 45m 58s	remaining: 32m 45s
584:	learn: 0.6499447	total: 46m 4s	remaining: 32m 40s
585:	learn: 0.6499426	total: 46m 8s	remaining: 32m 35s
586:	learn: 0.6499366	total: 46m 12s	remaining: 32m 30s
587:	learn: 0.6499339	total: 46m 17s	remaining: 32m 26s
588:	learn: 0.6499282	total: 46m 22s	remaining: 32m 21s
589:	learn: 0.6499260	total: 46m 27s	remaining: 32m 17s
590:	learn: 0.6499187	total: 46m 31s	remaining: 32m 12s
591:	learn: 0.6499129	total: 46m 36s	remaining: 32m 7s
592:	learn: 0.6499121	total: 46m 40s	remaining: 32m 2s
593:	learn: 0.6499091	total: 46m 45s	remaining: 31m 57s
594:	learn: 0.6499017	total: 46m 50s	remaining: 31m 52s
595:	learn: 0.6499000	total: 46m 54s	remaining: 31m 47s
596:	learn: 0.6498964	total: 46m 59s	remaining: 31m 43s
597:	learn: 0.6498914	total: 47m 4s	remaining: 31m 38s
598:	learn: 0.6498882	total: 47m 8s	remaining: 31m 33s
599:	learn: 0.6498835	total: 47m 13s	remaining: 31m 29s
600:	learn: 0.6498812	total: 47m 18s	remaining: 31m 24s
601:	learn: 0.6498787	total: 47m 23s	remaining: 31m 19s

602:	learn: 0.6498704	total: 47m 28s	remaining: 31m 15s
603:	learn: 0.6498665	total: 47m 33s	remaining: 31m 10s
604:	learn: 0.6498572	total: 47m 37s	remaining: 31m 5s
605:	learn: 0.6498555	total: 47m 42s	remaining: 31m
606:	learn: 0.6498512	total: 47m 46s	remaining: 30m 56s
607:	learn: 0.6498496	total: 47m 50s	remaining: 30m 50s
608:	learn: 0.6498460	total: 47m 55s	remaining: 30m 46s
609:	learn: 0.6498397	total: 48m	remaining: 30m 41s
610:	learn: 0.6498361	total: 48m 5s	remaining: 30m 36s
611:	learn: 0.6498349	total: 48m 10s	remaining: 30m 32s
612:	learn: 0.6498341	total: 48m 14s	remaining: 30m 27s
613:	learn: 0.6498307	total: 48m 18s	remaining: 30m 22s
614:	learn: 0.6498234	total: 48m 23s	remaining: 30m 17s
615:	learn: 0.6498210	total: 48m 28s	remaining: 30m 13s
616:	learn: 0.6498162	total: 48m 33s	remaining: 30m 8s
617:	learn: 0.6498136	total: 48m 38s	remaining: 30m 4s
618:	learn: 0.6498115	total: 48m 43s	remaining: 29m 59s
619:	learn: 0.6498069	total: 48m 48s	remaining: 29m 54s
620:	learn: 0.6498017	total: 48m 52s	remaining: 29m 49s
621:	learn: 0.6497997	total: 48m 57s	remaining: 29m 44s
622:	learn: 0.6497962	total: 49m 2s	remaining: 29m 40s
623:	learn: 0.6497940	total: 49m 7s	remaining: 29m 35s
624:	learn: 0.6497920	total: 49m 11s	remaining: 29m 30s
625:	learn: 0.6497904	total: 49m 15s	remaining: 29m 26s
626:	learn: 0.6497901	total: 49m 20s	remaining: 29m 21s
627:	learn: 0.6497885	total: 49m 25s	remaining: 29m 16s
628:	learn: 0.6497784	total: 49m 29s	remaining: 29m 11s
629:	learn: 0.6497754	total: 49m 34s	remaining: 29m 6s
630:	learn: 0.6497711	total: 49m 38s	remaining: 29m 1s
631:	learn: 0.6497671	total: 49m 43s	remaining: 28m 56s
632:	learn: 0.6497628	total: 49m 47s	remaining: 28m 52s
633:	learn: 0.6497591	total: 49m 52s	remaining: 28m 47s
634:	learn: 0.6497532	total: 49m 56s	remaining: 28m 42s
635:	learn: 0.6497454	total: 50m 1s	remaining: 28m 37s
636:	learn: 0.6497380	total: 50m 6s	remaining: 28m 33s
637:	learn: 0.6497351	total: 50m 11s	remaining: 28m 28s
638:	learn: 0.6497322	total: 50m 15s	remaining: 28m 23s
639:	learn: 0.6497318	total: 50m 19s	remaining: 28m 18s
640:	learn: 0.6497294	total: 50m 24s	remaining: 28m 14s
641:	learn: 0.6497283	total: 50m 29s	remaining: 28m 9s
642:	learn: 0.6497223	total: 50m 34s	remaining: 28m 4s
643:	learn: 0.6497203	total: 50m 39s	remaining: 28m
644:	learn: 0.6497185	total: 50m 44s	remaining: 27m 55s
645:	learn: 0.6497119	total: 50m 48s	remaining: 27m 50s
646:	learn: 0.6497021	total: 50m 53s	remaining: 27m 45s
647:	learn: 0.6497004	total: 50m 57s	remaining: 27m 41s
648:	learn: 0.6496958	total: 51m 2s	remaining: 27m 36s
649:	learn: 0.6496954	total: 51m 7s	remaining: 27m 31s

650:	learn: 0.6496927	total: 51m 12s	remaining: 27m 26s
651:	learn: 0.6496795	total: 51m 16s	remaining: 27m 21s
652:	learn: 0.6496777	total: 51m 20s	remaining: 27m 16s
653:	learn: 0.6496717	total: 51m 25s	remaining: 27m 12s
654:	learn: 0.6496658	total: 51m 30s	remaining: 27m 7s
655:	learn: 0.6496637	total: 51m 35s	remaining: 27m 3s
656:	learn: 0.6496627	total: 51m 39s	remaining: 26m 58s
657:	learn: 0.6496613	total: 51m 44s	remaining: 26m 53s
658:	learn: 0.6496579	total: 51m 49s	remaining: 26m 49s
659:	learn: 0.6496541	total: 51m 54s	remaining: 26m 44s
660:	learn: 0.6496537	total: 51m 58s	remaining: 26m 39s
661:	learn: 0.6496521	total: 52m 3s	remaining: 26m 34s
662:	learn: 0.6496467	total: 52m 8s	remaining: 26m 30s
663:	learn: 0.6496390	total: 52m 13s	remaining: 26m 25s
664:	learn: 0.6496373	total: 52m 17s	remaining: 26m 20s
665:	learn: 0.6496279	total: 52m 22s	remaining: 26m 15s
666:	learn: 0.6496248	total: 52m 27s	remaining: 26m 11s
667:	learn: 0.6496171	total: 52m 31s	remaining: 26m 6s
668:	learn: 0.6496104	total: 52m 36s	remaining: 26m 1s
669:	learn: 0.6496033	total: 52m 41s	remaining: 25m 57s
670:	learn: 0.6495943	total: 52m 46s	remaining: 25m 52s
671:	learn: 0.6495863	total: 52m 51s	remaining: 25m 47s
672:	learn: 0.6495824	total: 52m 56s	remaining: 25m 43s
673:	learn: 0.6495795	total: 53m 1s	remaining: 25m 38s
674:	learn: 0.6495723	total: 53m 5s	remaining: 25m 33s
675:	learn: 0.6495692	total: 53m 10s	remaining: 25m 29s
676:	learn: 0.6495682	total: 53m 15s	remaining: 25m 24s
677:	learn: 0.6495653	total: 53m 20s	remaining: 25m 19s
678:	learn: 0.6495640	total: 53m 25s	remaining: 25m 15s
679:	learn: 0.6495592	total: 53m 29s	remaining: 25m 10s
680:	learn: 0.6495556	total: 53m 34s	remaining: 25m 5s
681:	learn: 0.6495553	total: 53m 38s	remaining: 25m
682:	learn: 0.6495490	total: 53m 43s	remaining: 24m 56s
683:	learn: 0.6495476	total: 53m 48s	remaining: 24m 51s
684:	learn: 0.6495452	total: 53m 53s	remaining: 24m 46s
685:	learn: 0.6495422	total: 53m 58s	remaining: 24m 42s
686:	learn: 0.6495383	total: 54m 3s	remaining: 24m 37s
687:	learn: 0.6495338	total: 54m 7s	remaining: 24m 32s
688:	learn: 0.6495283	total: 54m 13s	remaining: 24m 28s
689:	learn: 0.6495226	total: 54m 17s	remaining: 24m 23s
690:	learn: 0.6495161	total: 54m 22s	remaining: 24m 18s
691:	learn: 0.6495090	total: 54m 27s	remaining: 24m 14s
692:	learn: 0.6495065	total: 54m 32s	remaining: 24m 9s
693:	learn: 0.6495022	total: 54m 37s	remaining: 24m 5s
694:	learn: 0.6494938	total: 54m 42s	remaining: 24m
695:	learn: 0.6494851	total: 54m 46s	remaining: 23m 55s
696:	learn: 0.6494842	total: 54m 51s	remaining: 23m 50s
697:	learn: 0.6494824	total: 54m 55s	remaining: 23m 45s

698:	learn: 0.6494761	total: 55m	remaining: 23m 41s
699:	learn: 0.6494674	total: 55m 4s	remaining: 23m 36s
700:	learn: 0.6494592	total: 55m 9s	remaining: 23m 31s
701:	learn: 0.6494537	total: 55m 14s	remaining: 23m 27s
702:	learn: 0.6494481	total: 55m 19s	remaining: 23m 22s
703:	learn: 0.6494432	total: 55m 24s	remaining: 23m 17s
704:	learn: 0.6494396	total: 55m 30s	remaining: 23m 13s
705:	learn: 0.6494365	total: 55m 34s	remaining: 23m 8s
706:	learn: 0.6494345	total: 55m 39s	remaining: 23m 4s
707:	learn: 0.6494329	total: 55m 43s	remaining: 22m 59s
708:	learn: 0.6494281	total: 55m 48s	remaining: 22m 54s
709:	learn: 0.6494205	total: 55m 53s	remaining: 22m 49s
710:	learn: 0.6494134	total: 55m 58s	remaining: 22m 45s
711:	learn: 0.6494107	total: 56m 3s	remaining: 22m 40s
712:	learn: 0.6494032	total: 56m 7s	remaining: 22m 35s
713:	learn: 0.6494025	total: 56m 12s	remaining: 22m 30s
714:	learn: 0.6493954	total: 56m 17s	remaining: 22m 26s
715:	learn: 0.6493908	total: 56m 22s	remaining: 22m 21s
716:	learn: 0.6493852	total: 56m 26s	remaining: 22m 16s
717:	learn: 0.6493826	total: 56m 31s	remaining: 22m 12s
718:	learn: 0.6493774	total: 56m 36s	remaining: 22m 7s
719:	learn: 0.6493764	total: 56m 41s	remaining: 22m 2s
720:	learn: 0.6493750	total: 56m 45s	remaining: 21m 57s
721:	learn: 0.6493672	total: 56m 50s	remaining: 21m 53s
722:	learn: 0.6493639	total: 56m 55s	remaining: 21m 48s
723:	learn: 0.6493580	total: 57m	remaining: 21m 43s
724:	learn: 0.6493571	total: 57m 4s	remaining: 21m 39s
725:	learn: 0.6493520	total: 57m 9s	remaining: 21m 34s
726:	learn: 0.6493482	total: 57m 14s	remaining: 21m 29s
727:	learn: 0.6493415	total: 57m 18s	remaining: 21m 24s
728:	learn: 0.6493383	total: 57m 23s	remaining: 21m 19s
729:	learn: 0.6493327	total: 57m 28s	remaining: 21m 15s
730:	learn: 0.6493312	total: 57m 33s	remaining: 21m 10s
731:	learn: 0.6493287	total: 57m 37s	remaining: 21m 5s
732:	learn: 0.6493237	total: 57m 42s	remaining: 21m 1s
733:	learn: 0.6493202	total: 57m 47s	remaining: 20m 56s
734:	learn: 0.6493168	total: 57m 51s	remaining: 20m 51s
735:	learn: 0.6493140	total: 57m 56s	remaining: 20m 46s
736:	learn: 0.6493078	total: 58m	remaining: 20m 42s
737:	learn: 0.6493038	total: 58m 4s	remaining: 20m 36s
738:	learn: 0.6492980	total: 58m 8s	remaining: 20m 32s
739:	learn: 0.6492951	total: 58m 13s	remaining: 20m 27s
740:	learn: 0.6492908	total: 58m 18s	remaining: 20m 22s
741:	learn: 0.6492865	total: 58m 22s	remaining: 20m 17s
742:	learn: 0.6492843	total: 58m 27s	remaining: 20m 13s
743:	learn: 0.6492831	total: 58m 32s	remaining: 20m 8s
744:	learn: 0.6492824	total: 58m 36s	remaining: 20m 3s
745:	learn: 0.6492802	total: 58m 41s	remaining: 19m 59s

746:	learn: 0.6492775	total: 58m 45s	remaining: 19m 53s
747:	learn: 0.6492760	total: 58m 50s	remaining: 19m 49s
748:	learn: 0.6492698	total: 58m 54s	remaining: 19m 44s
749:	learn: 0.6492656	total: 58m 58s	remaining: 19m 39s
750:	learn: 0.6492614	total: 59m 2s	remaining: 19m 34s
751:	learn: 0.6492581	total: 59m 6s	remaining: 19m 29s
752:	learn: 0.6492561	total: 59m 11s	remaining: 19m 25s
753:	learn: 0.6492552	total: 59m 16s	remaining: 19m 20s
754:	learn: 0.6492528	total: 59m 21s	remaining: 19m 15s
755:	learn: 0.6492484	total: 59m 25s	remaining: 19m 10s
756:	learn: 0.6492447	total: 59m 31s	remaining: 19m 6s
757:	learn: 0.6492432	total: 59m 35s	remaining: 19m 1s
758:	learn: 0.6492388	total: 59m 40s	remaining: 18m 56s
759:	learn: 0.6492301	total: 59m 45s	remaining: 18m 52s
760:	learn: 0.6492276	total: 59m 50s	remaining: 18m 47s
761:	learn: 0.6492130	total: 59m 55s	remaining: 18m 42s
762:	learn: 0.6492103	total: 59m 59s	remaining: 18m 38s
763:	learn: 0.6492076	total: 1h 4s	remaining: 18m 33s
764:	learn: 0.6492040	total: 1h 8s	remaining: 18m 28s
765:	learn: 0.6491975	total: 1h 13s	remaining: 18m 23s
766:	learn: 0.6491940	total: 1h 17s	remaining: 18m 18s
767:	learn: 0.6491894	total: 1h 22s	remaining: 18m 14s
768:	learn: 0.6491826	total: 1h 27s	remaining: 18m 9s
769:	learn: 0.6491782	total: 1h 32s	remaining: 18m 4s
770:	learn: 0.6491731	total: 1h 36s	remaining: 18m
771:	learn: 0.6491703	total: 1h 41s	remaining: 17m 55s
772:	learn: 0.6491699	total: 1h 46s	remaining: 17m 50s
773:	learn: 0.6491690	total: 1h 50s	remaining: 17m 45s
774:	learn: 0.6491650	total: 1h 55s	remaining: 17m 41s
775:	learn: 0.6491578	total: 1h 1m	remaining: 17m 36s
776:	learn: 0.6491548	total: 1h 1m 5s	remaining: 17m 31s
777:	learn: 0.6491479	total: 1h 1m 9s	remaining: 17m 27s
778:	learn: 0.6491448	total: 1h 1m 14s	remaining: 17m 22s
779:	learn: 0.6491397	total: 1h 1m 18s	remaining: 17m 17s
780:	learn: 0.6491386	total: 1h 1m 23s	remaining: 17m 12s
781:	learn: 0.6491366	total: 1h 1m 27s	remaining: 17m 7s
782:	learn: 0.6491340	total: 1h 1m 32s	remaining: 17m 3s
783:	learn: 0.6491309	total: 1h 1m 36s	remaining: 16m 58s
784:	learn: 0.6491299	total: 1h 1m 41s	remaining: 16m 53s
785:	learn: 0.6491263	total: 1h 1m 46s	remaining: 16m 49s
786:	learn: 0.6491159	total: 1h 1m 51s	remaining: 16m 44s
787:	learn: 0.6491125	total: 1h 1m 56s	remaining: 16m 39s
788:	learn: 0.6491085	total: 1h 2m	remaining: 16m 35s
789:	learn: 0.6491066	total: 1h 2m 5s	remaining: 16m 30s
790:	learn: 0.6491030	total: 1h 2m 10s	remaining: 16m 25s
791:	learn: 0.6490971	total: 1h 2m 14s	remaining: 16m 20s
792:	learn: 0.6490946	total: 1h 2m 19s	remaining: 16m 16s
793:	learn: 0.6490905	total: 1h 2m 24s	remaining: 16m 11s

794:	learn: 0.6490884	total: 1h 2m 29s	remaining: 16m 6s
795:	learn: 0.6490838	total: 1h 2m 33s	remaining: 16m 2s
796:	learn: 0.6490825	total: 1h 2m 38s	remaining: 15m 57s
797:	learn: 0.6490767	total: 1h 2m 43s	remaining: 15m 52s
798:	learn: 0.6490705	total: 1h 2m 48s	remaining: 15m 48s
799:	learn: 0.6490619	total: 1h 2m 52s	remaining: 15m 43s
800:	learn: 0.6490588	total: 1h 2m 57s	remaining: 15m 38s
801:	learn: 0.6490582	total: 1h 3m 1s	remaining: 15m 33s
802:	learn: 0.6490529	total: 1h 3m 6s	remaining: 15m 28s
803:	learn: 0.6490497	total: 1h 3m 11s	remaining: 15m 24s
804:	learn: 0.6490484	total: 1h 3m 15s	remaining: 15m 19s
805:	learn: 0.6490470	total: 1h 3m 19s	remaining: 15m 14s
806:	learn: 0.6490453	total: 1h 3m 24s	remaining: 15m 9s
807:	learn: 0.6490409	total: 1h 3m 30s	remaining: 15m 5s
808:	learn: 0.6490383	total: 1h 3m 35s	remaining: 15m
809:	learn: 0.6490374	total: 1h 3m 40s	remaining: 14m 56s
810:	learn: 0.6490356	total: 1h 3m 45s	remaining: 14m 51s
811:	learn: 0.6490315	total: 1h 3m 49s	remaining: 14m 46s
812:	learn: 0.6490307	total: 1h 3m 54s	remaining: 14m 41s
813:	learn: 0.6490282	total: 1h 3m 59s	remaining: 14m 37s
814:	learn: 0.6490248	total: 1h 4m 3s	remaining: 14m 32s
815:	learn: 0.6490195	total: 1h 4m 8s	remaining: 14m 27s
816:	learn: 0.6490161	total: 1h 4m 13s	remaining: 14m 23s
817:	learn: 0.6490128	total: 1h 4m 18s	remaining: 14m 18s
818:	learn: 0.6490101	total: 1h 4m 22s	remaining: 14m 13s
819:	learn: 0.6490068	total: 1h 4m 28s	remaining: 14m 9s
820:	learn: 0.6490006	total: 1h 4m 32s	remaining: 14m 4s
821:	learn: 0.6489970	total: 1h 4m 37s	remaining: 13m 59s
822:	learn: 0.6489954	total: 1h 4m 42s	remaining: 13m 54s
823:	learn: 0.6489909	total: 1h 4m 47s	remaining: 13m 50s
824:	learn: 0.6489886	total: 1h 4m 51s	remaining: 13m 45s
825:	learn: 0.6489843	total: 1h 4m 56s	remaining: 13m 40s
826:	learn: 0.6489817	total: 1h 5m 1s	remaining: 13m 36s
827:	learn: 0.6489803	total: 1h 5m 6s	remaining: 13m 31s
828:	learn: 0.6489784	total: 1h 5m 11s	remaining: 13m 26s
829:	learn: 0.6489727	total: 1h 5m 15s	remaining: 13m 21s
830:	learn: 0.6489693	total: 1h 5m 20s	remaining: 13m 17s
831:	learn: 0.6489659	total: 1h 5m 25s	remaining: 13m 12s
832:	learn: 0.6489633	total: 1h 5m 30s	remaining: 13m 7s
833:	learn: 0.6489604	total: 1h 5m 35s	remaining: 13m 3s
834:	learn: 0.6489567	total: 1h 5m 39s	remaining: 12m 58s
835:	learn: 0.6489522	total: 1h 5m 44s	remaining: 12m 53s
836:	learn: 0.6489484	total: 1h 5m 49s	remaining: 12m 49s
837:	learn: 0.6489443	total: 1h 5m 54s	remaining: 12m 44s
838:	learn: 0.6489430	total: 1h 5m 59s	remaining: 12m 39s
839:	learn: 0.6489406	total: 1h 6m 4s	remaining: 12m 35s
840:	learn: 0.6489345	total: 1h 6m 8s	remaining: 12m 30s
841:	learn: 0.6489307	total: 1h 6m 13s	remaining: 12m 25s

842:	learn: 0.6489292	total: 1h 6m 17s	remaining: 12m 20s
843:	learn: 0.6489238	total: 1h 6m 21s	remaining: 12m 15s
844:	learn: 0.6489204	total: 1h 6m 26s	remaining: 12m 11s
845:	learn: 0.6489150	total: 1h 6m 31s	remaining: 12m 6s
846:	learn: 0.6489121	total: 1h 6m 35s	remaining: 12m 1s
847:	learn: 0.6489110	total: 1h 6m 40s	remaining: 11m 56s
848:	learn: 0.6489063	total: 1h 6m 44s	remaining: 11m 52s
849:	learn: 0.6489009	total: 1h 6m 49s	remaining: 11m 47s
850:	learn: 0.6488974	total: 1h 6m 54s	remaining: 11m 42s
851:	learn: 0.6488947	total: 1h 6m 59s	remaining: 11m 38s
852:	learn: 0.6488882	total: 1h 7m 3s	remaining: 11m 33s
853:	learn: 0.6488860	total: 1h 7m 8s	remaining: 11m 28s
854:	learn: 0.6488836	total: 1h 7m 13s	remaining: 11m 24s
855:	learn: 0.6488778	total: 1h 7m 18s	remaining: 11m 19s
856:	learn: 0.6488760	total: 1h 7m 23s	remaining: 11m 14s
857:	learn: 0.6488751	total: 1h 7m 27s	remaining: 11m 9s
858:	learn: 0.6488725	total: 1h 7m 31s	remaining: 11m 5s
859:	learn: 0.6488695	total: 1h 7m 36s	remaining: 11m
860:	learn: 0.6488609	total: 1h 7m 41s	remaining: 10m 55s
861:	learn: 0.6488589	total: 1h 7m 45s	remaining: 10m 50s
862:	learn: 0.6488539	total: 1h 7m 49s	remaining: 10m 46s
863:	learn: 0.6488500	total: 1h 7m 54s	remaining: 10m 41s
864:	learn: 0.6488454	total: 1h 7m 59s	remaining: 10m 36s
865:	learn: 0.6488432	total: 1h 8m 3s	remaining: 10m 31s
866:	learn: 0.6488401	total: 1h 8m 8s	remaining: 10m 27s
867:	learn: 0.6488316	total: 1h 8m 13s	remaining: 10m 22s
868:	learn: 0.6488272	total: 1h 8m 18s	remaining: 10m 17s
869:	learn: 0.6488232	total: 1h 8m 22s	remaining: 10m 13s
870:	learn: 0.6488191	total: 1h 8m 27s	remaining: 10m 8s
871:	learn: 0.6488171	total: 1h 8m 32s	remaining: 10m 3s
872:	learn: 0.6488114	total: 1h 8m 36s	remaining: 9m 58s
873:	learn: 0.6488081	total: 1h 8m 40s	remaining: 9m 54s
874:	learn: 0.6488002	total: 1h 8m 44s	remaining: 9m 49s
875:	learn: 0.6487967	total: 1h 8m 50s	remaining: 9m 44s
876:	learn: 0.6487955	total: 1h 8m 55s	remaining: 9m 40s
877:	learn: 0.6487946	total: 1h 9m 1s	remaining: 9m 35s
878:	learn: 0.6487932	total: 1h 9m 6s	remaining: 9m 30s
879:	learn: 0.6487883	total: 1h 9m 11s	remaining: 9m 26s
880:	learn: 0.6487833	total: 1h 9m 15s	remaining: 9m 21s
881:	learn: 0.6487765	total: 1h 9m 20s	remaining: 9m 16s
882:	learn: 0.6487723	total: 1h 9m 25s	remaining: 9m 11s
883:	learn: 0.6487700	total: 1h 9m 30s	remaining: 9m 7s
884:	learn: 0.6487651	total: 1h 9m 35s	remaining: 9m 2s
885:	learn: 0.6487568	total: 1h 9m 40s	remaining: 8m 57s
886:	learn: 0.6487547	total: 1h 9m 45s	remaining: 8m 53s
887:	learn: 0.6487520	total: 1h 9m 51s	remaining: 8m 48s
888:	learn: 0.6487496	total: 1h 9m 57s	remaining: 8m 44s
889:	learn: 0.6487472	total: 1h 10m 2s	remaining: 8m 39s

890:	learn: 0.6487411	total: 1h 10m 7s	remaining: 8m 34s
891:	learn: 0.6487407	total: 1h 10m 11s	remaining: 8m 29s
892:	learn: 0.6487377	total: 1h 10m 16s	remaining: 8m 25s
893:	learn: 0.6487363	total: 1h 10m 21s	remaining: 8m 20s
894:	learn: 0.6487344	total: 1h 10m 25s	remaining: 8m 15s
895:	learn: 0.6487294	total: 1h 10m 30s	remaining: 8m 11s
896:	learn: 0.6487263	total: 1h 10m 35s	remaining: 8m 6s
897:	learn: 0.6487246	total: 1h 10m 40s	remaining: 8m 1s
898:	learn: 0.6487210	total: 1h 10m 44s	remaining: 7m 56s
899:	learn: 0.6487169	total: 1h 10m 48s	remaining: 7m 52s
900:	learn: 0.6487150	total: 1h 10m 53s	remaining: 7m 47s
901:	learn: 0.6487137	total: 1h 10m 58s	remaining: 7m 42s
902:	learn: 0.6487064	total: 1h 11m 3s	remaining: 7m 37s
903:	learn: 0.6487026	total: 1h 11m 8s	remaining: 7m 33s
904:	learn: 0.6486989	total: 1h 11m 13s	remaining: 7m 28s
905:	learn: 0.6486975	total: 1h 11m 17s	remaining: 7m 23s
906:	learn: 0.6486955	total: 1h 11m 22s	remaining: 7m 19s
907:	learn: 0.6486830	total: 1h 11m 26s	remaining: 7m 14s
908:	learn: 0.6486779	total: 1h 11m 31s	remaining: 7m 9s
909:	learn: 0.6486764	total: 1h 11m 34s	remaining: 7m 4s
910:	learn: 0.6486717	total: 1h 11m 38s	remaining: 6m 59s
911:	learn: 0.6486664	total: 1h 11m 43s	remaining: 6m 55s
912:	learn: 0.6486632	total: 1h 11m 48s	remaining: 6m 50s
913:	learn: 0.6486615	total: 1h 11m 53s	remaining: 6m 45s
914:	learn: 0.6486582	total: 1h 11m 58s	remaining: 6m 41s
915:	learn: 0.6486561	total: 1h 12m 2s	remaining: 6m 36s
916:	learn: 0.6486537	total: 1h 12m 8s	remaining: 6m 31s
917:	learn: 0.6486477	total: 1h 12m 13s	remaining: 6m 27s
918:	learn: 0.6486465	total: 1h 12m 19s	remaining: 6m 22s
919:	learn: 0.6486436	total: 1h 12m 25s	remaining: 6m 17s
920:	learn: 0.6486390	total: 1h 12m 30s	remaining: 6m 13s
921:	learn: 0.6486367	total: 1h 12m 35s	remaining: 6m 8s
922:	learn: 0.6486293	total: 1h 12m 41s	remaining: 6m 3s
923:	learn: 0.6486257	total: 1h 12m 45s	remaining: 5m 59s
924:	learn: 0.6486231	total: 1h 12m 50s	remaining: 5m 54s
925:	learn: 0.6486227	total: 1h 12m 55s	remaining: 5m 49s
926:	learn: 0.6486196	total: 1h 13m	remaining: 5m 44s
927:	learn: 0.6486177	total: 1h 13m 4s	remaining: 5m 40s
928:	learn: 0.6486163	total: 1h 13m 9s	remaining: 5m 35s
929:	learn: 0.6486143	total: 1h 13m 13s	remaining: 5m 30s
930:	learn: 0.6486127	total: 1h 13m 17s	remaining: 5m 25s
931:	learn: 0.6486089	total: 1h 13m 22s	remaining: 5m 21s
932:	learn: 0.6486071	total: 1h 13m 27s	remaining: 5m 16s
933:	learn: 0.6486059	total: 1h 13m 32s	remaining: 5m 11s
934:	learn: 0.6486049	total: 1h 13m 36s	remaining: 5m 7s
935:	learn: 0.6486025	total: 1h 13m 41s	remaining: 5m 2s
936:	learn: 0.6485955	total: 1h 13m 45s	remaining: 4m 57s
937:	learn: 0.6485934	total: 1h 13m 50s	remaining: 4m 52s

938:	learn: 0.6485901	total: 1h 13m 54s	remaining: 4m 48s
939:	learn: 0.6485887	total: 1h 13m 59s	remaining: 4m 43s
940:	learn: 0.6485869	total: 1h 14m 3s	remaining: 4m 38s
941:	learn: 0.6485825	total: 1h 14m 8s	remaining: 4m 33s
942:	learn: 0.6485804	total: 1h 14m 13s	remaining: 4m 29s
943:	learn: 0.6485789	total: 1h 14m 18s	remaining: 4m 24s
944:	learn: 0.6485773	total: 1h 14m 23s	remaining: 4m 19s
945:	learn: 0.6485759	total: 1h 14m 28s	remaining: 4m 15s
946:	learn: 0.6485744	total: 1h 14m 34s	remaining: 4m 10s
947:	learn: 0.6485709	total: 1h 14m 38s	remaining: 4m 5s
948:	learn: 0.6485680	total: 1h 14m 43s	remaining: 4m
949:	learn: 0.6485645	total: 1h 14m 48s	remaining: 3m 56s
950:	learn: 0.6485589	total: 1h 14m 53s	remaining: 3m 51s
951:	learn: 0.6485582	total: 1h 14m 58s	remaining: 3m 46s
952:	learn: 0.6485571	total: 1h 15m 3s	remaining: 3m 42s
953:	learn: 0.6485548	total: 1h 15m 8s	remaining: 3m 37s
954:	learn: 0.6485510	total: 1h 15m 12s	remaining: 3m 32s
955:	learn: 0.6485478	total: 1h 15m 16s	remaining: 3m 27s
956:	learn: 0.6485473	total: 1h 15m 21s	remaining: 3m 23s
957:	learn: 0.6485441	total: 1h 15m 26s	remaining: 3m 18s
958:	learn: 0.6485422	total: 1h 15m 30s	remaining: 3m 13s
959:	learn: 0.6485411	total: 1h 15m 34s	remaining: 3m 8s
960:	learn: 0.6485353	total: 1h 15m 39s	remaining: 3m 4s
961:	learn: 0.6485317	total: 1h 15m 44s	remaining: 2m 59s
962:	learn: 0.6485283	total: 1h 15m 49s	remaining: 2m 54s
963:	learn: 0.6485228	total: 1h 15m 53s	remaining: 2m 50s
964:	learn: 0.6485194	total: 1h 15m 58s	remaining: 2m 45s
965:	learn: 0.6485153	total: 1h 16m 3s	remaining: 2m 40s
966:	learn: 0.6485135	total: 1h 16m 8s	remaining: 2m 35s
967:	learn: 0.6485090	total: 1h 16m 13s	remaining: 2m 31s
968:	learn: 0.6485090	total: 1h 16m 17s	remaining: 2m 26s
969:	learn: 0.6485066	total: 1h 16m 22s	remaining: 2m 21s
970:	learn: 0.6485043	total: 1h 16m 27s	remaining: 2m 16s
971:	learn: 0.6485018	total: 1h 16m 32s	remaining: 2m 12s
972:	learn: 0.6484987	total: 1h 16m 37s	remaining: 2m 7s
973:	learn: 0.6484949	total: 1h 16m 42s	remaining: 2m 2s
974:	learn: 0.6484918	total: 1h 16m 47s	remaining: 1m 58s
975:	learn: 0.6484885	total: 1h 16m 52s	remaining: 1m 53s
976:	learn: 0.6484859	total: 1h 16m 57s	remaining: 1m 48s
977:	learn: 0.6484804	total: 1h 17m 2s	remaining: 1m 43s
978:	learn: 0.6484751	total: 1h 17m 6s	remaining: 1m 39s
979:	learn: 0.6484717	total: 1h 17m 12s	remaining: 1m 34s
980:	learn: 0.6484665	total: 1h 17m 17s	remaining: 1m 29s
981:	learn: 0.6484659	total: 1h 17m 21s	remaining: 1m 25s
982:	learn: 0.6484628	total: 1h 17m 26s	remaining: 1m 20s
983:	learn: 0.6484564	total: 1h 17m 31s	remaining: 1m 15s
984:	learn: 0.6484488	total: 1h 17m 35s	remaining: 1m 10s
985:	learn: 0.6484438	total: 1h 17m 40s	remaining: 1m 6s

```

986:   learn: 0.6484401      total: 1h 17m 45s      remaining: 1m 1s
987:   learn: 0.6484348      total: 1h 17m 50s      remaining: 56.7s
988:   learn: 0.6484305      total: 1h 17m 54s      remaining: 52s
989:   learn: 0.6484251      total: 1h 17m 59s      remaining: 47.3s
990:   learn: 0.6484162      total: 1h 18m 4s       remaining: 42.5s
991:   learn: 0.6484156      total: 1h 18m 7s       remaining: 37.8s
992:   learn: 0.6484090      total: 1h 18m 12s      remaining: 33.1s
993:   learn: 0.6484042      total: 1h 18m 17s      remaining: 28.4s
994:   learn: 0.6484023      total: 1h 18m 22s      remaining: 23.6s
995:   learn: 0.6483997      total: 1h 18m 26s      remaining: 18.9s
996:   learn: 0.6483992      total: 1h 18m 31s      remaining: 14.2s
997:   learn: 0.6483972      total: 1h 18m 35s      remaining: 9.45s
998:   learn: 0.6483895      total: 1h 18m 40s      remaining: 4.72s
999:   learn: 0.6483875      total: 1h 18m 45s      remaining: 0us
CPU times: user 14h 49min 53s, sys: 7min 7s, total: 14h 57min
Wall time: 1h 19min 26s

```

```

[24]: %%time

# Predict class
pred_train = cat_boost.predict(X_train)
pred_test = cat_boost.predict(X_test)

# Predict probability
pred_score_train = cat_boost.predict_proba(X_train)[: , 1]
pred_score_test = cat_boost.predict_proba(X_test)[: , 1]

print('Accuracy in training set: {:.3f}'.format(accuracy_score(y_train,
↳pred_train)))
print('Accuracy in testing set: {:.3f}'.format(accuracy_score(y_test,
↳pred_test)))

print('\nAUC in training set: {:.3f}'.format(roc_auc_score(y_train,
↳pred_score_train)))
print('AUC in testing set: {:.3f}'.format(roc_auc_score(y_test,
↳pred_score_test)))

```

```

Accuracy in training set: 0.620
Accuracy in testing set: 0.616

AUC in training set: 0.667
AUC in testing set: 0.661
CPU times: user 8min 41s, sys: 6.46 s, total: 8min 47s
Wall time: 1min 21s

```

```

[25]: #%%script false --no-raise-error

```

```

# Prediction score/probability
pred_score_test = cat_boost.predict_proba(X_test)[: , 1]

fpr, tpr, thresholds = roc_curve(y_test, pred_score_test)
auc_score = roc_auc_score(y_test, pred_score_test)

def plot_roc_curve(fpr, tpr, auc_score, legend=None):
    plt.plot(fpr, tpr, linewidth=2, c='red')
    plt.plot([0, 1], [0, 1], 'k--')
    plt.xlabel('False Positive Rate')
    plt.ylabel('True Positive Rate')
    plt.xlim([0, 1])
    plt.ylim([0, 1])
    plt.legend(['{}', AUC: {:.2f}'].format(legend, auc_score), 'CatBoost'],
loc='lower right')
    plt.title('ROC Curve', weight='bold')

plot_roc_curve(fpr, tpr, auc_score, 'CatBoost')

# Confusion matrix
def plot_confusion_matrix(cm, classes,
                           normalize=False,
                           title='Confusion matrix',
                           cmap=plt.cm.Blues):
    """
    This function prints and plots the confusion matrix.
    Normalization can be applied by setting `normalize=True`.
    """
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(classes))
    plt.xticks(tick_marks, classes, rotation=45)
    plt.yticks(tick_marks, classes)

    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
        cm = np.round(cm, 2)
        print("Normalized confusion matrix")
    else:
        print('Confusion matrix, without normalization')

    print(cm)

    thresh = cm.max() / 2.
    for i in range (cm.shape[0]):

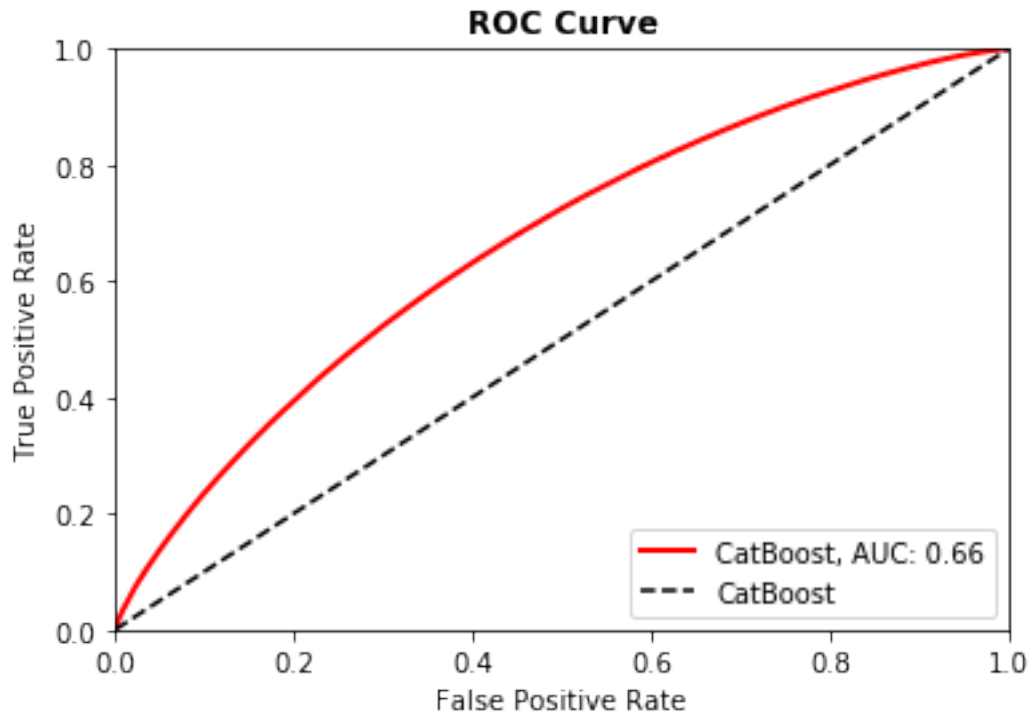
```

```

for j in range (cm.shape[1]):
    plt.text(j, i, cm[i, j],
             horizontalalignment="center",
             color="white" if cm[i, j] > thresh else "black")

plt.tight_layout()
plt.ylabel('True label')
plt.xlabel('Predicted label')

```



```

[26]: %%script false --no-raise-error

y_pred = pred_test
class_names = ['Not Detected', 'Detected']

# Compute confusion matrix
cm = confusion_matrix(y_test, y_pred)

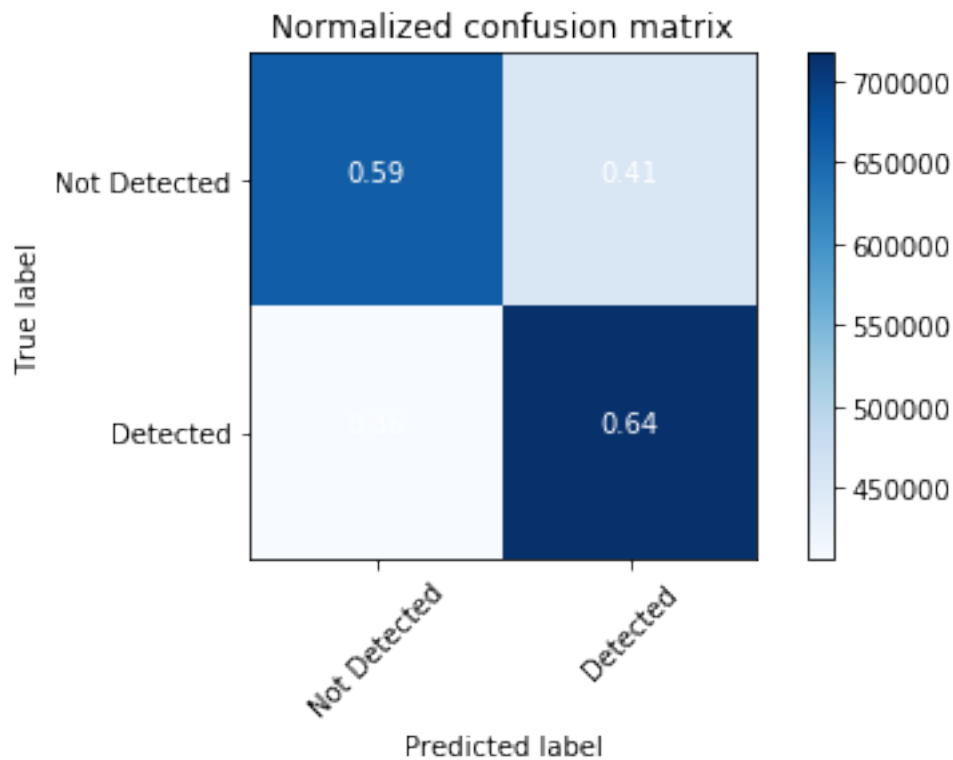
# Plot confusion matrix
plt.figure()
plot_confusion_matrix(cm, classes=class_names, normalize=True,
                      title='Normalized confusion matrix')

plt.show()

```

Normalized confusion matrix

```
[[0.59 0.41]
 [0.36 0.64]]
```



4.0.3 Model 3: CatBoost on all features except settings

```
[27]: %%time

df_cat = df_notsettings
# Splitting features into test and train sets
X_train, X_test, y_train, y_test = train_test_split(df_cat, np.array(label),
    ↳test_size=0.3, random_state=42)

print('Train X: {}'.format(X_train.shape))
print('Test X: {}'.format(X_test.shape))
print('Train y: {}'.format(y_train.shape))
print('Test y: {}'.format(y_test.shape))

# Get categorical columns
columns = df_cat.columns
types = df_cat.dtypes
columns_cat = list(types[types == 'category'].index)
```

```

columns_cat_idx = [idx for idx, col in enumerate(columns) if col in columns_cat]

# Train the model
cat_boost = CatBoostClassifier(custom_metric='AUC')
cat_boost.fit(X_train, y_train, columns_cat_idx)

```

Train X: (5224247, 28)

Test X: (2238963, 28)

Train y: (5224247,)

Test y: (2238963,)

Learning rate set to 0.398593

0:	learn: 0.6762810	total: 2.5s	remaining: 41m 39s
1:	learn: 0.6695264	total: 4.77s	remaining: 39m 39s
2:	learn: 0.6660483	total: 6.89s	remaining: 38m 9s
3:	learn: 0.6635251	total: 8.99s	remaining: 37m 18s
4:	learn: 0.6616446	total: 11.2s	remaining: 37m 16s
5:	learn: 0.6605925	total: 13.5s	remaining: 37m 22s
6:	learn: 0.6596336	total: 15.9s	remaining: 37m 39s
7:	learn: 0.6588190	total: 18.5s	remaining: 38m 19s
8:	learn: 0.6579279	total: 21s	remaining: 38m 27s
9:	learn: 0.6575273	total: 23.5s	remaining: 38m 49s
10:	learn: 0.6570139	total: 26s	remaining: 38m 58s
11:	learn: 0.6564756	total: 28.6s	remaining: 39m 17s
12:	learn: 0.6558707	total: 30.7s	remaining: 38m 54s
13:	learn: 0.6554550	total: 33s	remaining: 38m 46s
14:	learn: 0.6550968	total: 35.1s	remaining: 38m 27s
15:	learn: 0.6546825	total: 37.5s	remaining: 38m 28s
16:	learn: 0.6543764	total: 40s	remaining: 38m 32s
17:	learn: 0.6540814	total: 42.5s	remaining: 38m 41s
18:	learn: 0.6537190	total: 44.7s	remaining: 38m 29s
19:	learn: 0.6534400	total: 47.2s	remaining: 38m 30s
20:	learn: 0.6532639	total: 49.4s	remaining: 38m 21s
21:	learn: 0.6531059	total: 52.2s	remaining: 38m 39s
22:	learn: 0.6529278	total: 54.6s	remaining: 38m 39s
23:	learn: 0.6525780	total: 56.8s	remaining: 38m 28s
24:	learn: 0.6523943	total: 59s	remaining: 38m 19s
25:	learn: 0.6522192	total: 1m 1s	remaining: 38m 26s
26:	learn: 0.6519552	total: 1m 3s	remaining: 38m 21s
27:	learn: 0.6517890	total: 1m 6s	remaining: 38m 17s
28:	learn: 0.6516082	total: 1m 8s	remaining: 38m 6s
29:	learn: 0.6513665	total: 1m 10s	remaining: 37m 57s
30:	learn: 0.6512026	total: 1m 12s	remaining: 37m 51s
31:	learn: 0.6510811	total: 1m 14s	remaining: 37m 48s
32:	learn: 0.6509440	total: 1m 16s	remaining: 37m 33s
33:	learn: 0.6507608	total: 1m 18s	remaining: 37m 20s
34:	learn: 0.6506748	total: 1m 21s	remaining: 37m 13s
35:	learn: 0.6505212	total: 1m 23s	remaining: 37m 13s

36:	learn: 0.6504024	total: 1m 25s	remaining: 37m 10s
37:	learn: 0.6502855	total: 1m 28s	remaining: 37m 10s
38:	learn: 0.6501587	total: 1m 30s	remaining: 37m 7s
39:	learn: 0.6500634	total: 1m 32s	remaining: 37m 10s
40:	learn: 0.6499720	total: 1m 35s	remaining: 37m 12s
41:	learn: 0.6498816	total: 1m 37s	remaining: 37m 12s
42:	learn: 0.6497809	total: 1m 40s	remaining: 37m 11s
43:	learn: 0.6496768	total: 1m 42s	remaining: 37m 5s
44:	learn: 0.6495557	total: 1m 44s	remaining: 37m 1s
45:	learn: 0.6494857	total: 1m 46s	remaining: 36m 56s
46:	learn: 0.6493279	total: 1m 49s	remaining: 36m 55s
47:	learn: 0.6492302	total: 1m 51s	remaining: 36m 51s
48:	learn: 0.6491520	total: 1m 54s	remaining: 36m 56s
49:	learn: 0.6490628	total: 1m 56s	remaining: 36m 59s
50:	learn: 0.6488987	total: 1m 58s	remaining: 36m 53s
51:	learn: 0.6488281	total: 2m 1s	remaining: 36m 50s
52:	learn: 0.6487522	total: 2m 3s	remaining: 36m 46s
53:	learn: 0.6486827	total: 2m 5s	remaining: 36m 40s
54:	learn: 0.6485757	total: 2m 7s	remaining: 36m 33s
55:	learn: 0.6485032	total: 2m 9s	remaining: 36m 29s
56:	learn: 0.6484365	total: 2m 12s	remaining: 36m 24s
57:	learn: 0.6483744	total: 2m 14s	remaining: 36m 22s
58:	learn: 0.6482999	total: 2m 16s	remaining: 36m 16s
59:	learn: 0.6482571	total: 2m 18s	remaining: 36m 10s
60:	learn: 0.6482102	total: 2m 20s	remaining: 36m 8s
61:	learn: 0.6481306	total: 2m 23s	remaining: 36m 7s
62:	learn: 0.6480265	total: 2m 25s	remaining: 35m 59s
63:	learn: 0.6479306	total: 2m 27s	remaining: 35m 53s
64:	learn: 0.6478513	total: 2m 29s	remaining: 35m 47s
65:	learn: 0.6477988	total: 2m 31s	remaining: 35m 46s
66:	learn: 0.6476992	total: 2m 33s	remaining: 35m 41s
67:	learn: 0.6476393	total: 2m 35s	remaining: 35m 35s
68:	learn: 0.6475880	total: 2m 37s	remaining: 35m 29s
69:	learn: 0.6475403	total: 2m 39s	remaining: 35m 25s
70:	learn: 0.6474549	total: 2m 42s	remaining: 35m 23s
71:	learn: 0.6474226	total: 2m 44s	remaining: 35m 20s
72:	learn: 0.6473754	total: 2m 47s	remaining: 35m 21s
73:	learn: 0.6473443	total: 2m 49s	remaining: 35m 17s
74:	learn: 0.6473007	total: 2m 51s	remaining: 35m 14s
75:	learn: 0.6472359	total: 2m 53s	remaining: 35m 13s
76:	learn: 0.6471971	total: 2m 56s	remaining: 35m 14s
77:	learn: 0.6471443	total: 2m 58s	remaining: 35m 12s
78:	learn: 0.6471150	total: 3m 1s	remaining: 35m 11s
79:	learn: 0.6470579	total: 3m 3s	remaining: 35m 8s
80:	learn: 0.6469919	total: 3m 5s	remaining: 35m 5s
81:	learn: 0.6469458	total: 3m 7s	remaining: 35m 2s
82:	learn: 0.6469222	total: 3m 10s	remaining: 34m 59s
83:	learn: 0.6468916	total: 3m 12s	remaining: 34m 56s

84:	learn: 0.6468613	total: 3m 14s	remaining: 34m 51s
85:	learn: 0.6468074	total: 3m 16s	remaining: 34m 51s
86:	learn: 0.6467737	total: 3m 19s	remaining: 34m 50s
87:	learn: 0.6467274	total: 3m 21s	remaining: 34m 49s
88:	learn: 0.6466934	total: 3m 23s	remaining: 34m 45s
89:	learn: 0.6466370	total: 3m 25s	remaining: 34m 39s
90:	learn: 0.6465788	total: 3m 27s	remaining: 34m 30s
91:	learn: 0.6465283	total: 3m 29s	remaining: 34m 24s
92:	learn: 0.6464952	total: 3m 31s	remaining: 34m 22s
93:	learn: 0.6464628	total: 3m 33s	remaining: 34m 16s
94:	learn: 0.6464239	total: 3m 35s	remaining: 34m 13s
95:	learn: 0.6463835	total: 3m 37s	remaining: 34m 10s
96:	learn: 0.6463681	total: 3m 39s	remaining: 34m 6s
97:	learn: 0.6463354	total: 3m 42s	remaining: 34m 5s
98:	learn: 0.6463132	total: 3m 44s	remaining: 34m 4s
99:	learn: 0.6462538	total: 3m 46s	remaining: 34m 1s
100:	learn: 0.6462133	total: 3m 48s	remaining: 33m 57s
101:	learn: 0.6461837	total: 3m 51s	remaining: 33m 56s
102:	learn: 0.6461476	total: 3m 53s	remaining: 33m 52s
103:	learn: 0.6461115	total: 3m 55s	remaining: 33m 52s
104:	learn: 0.6460769	total: 3m 58s	remaining: 33m 49s
105:	learn: 0.6460408	total: 4m	remaining: 33m 45s
106:	learn: 0.6460108	total: 4m 2s	remaining: 33m 41s
107:	learn: 0.6459843	total: 4m 4s	remaining: 33m 37s
108:	learn: 0.6459639	total: 4m 6s	remaining: 33m 37s
109:	learn: 0.6459244	total: 4m 8s	remaining: 33m 33s
110:	learn: 0.6458908	total: 4m 10s	remaining: 33m 27s
111:	learn: 0.6458664	total: 4m 12s	remaining: 33m 23s
112:	learn: 0.6458532	total: 4m 14s	remaining: 33m 18s
113:	learn: 0.6457995	total: 4m 16s	remaining: 33m 14s
114:	learn: 0.6457650	total: 4m 18s	remaining: 33m 11s
115:	learn: 0.6457504	total: 4m 21s	remaining: 33m 10s
116:	learn: 0.6457304	total: 4m 23s	remaining: 33m 9s
117:	learn: 0.6456912	total: 4m 25s	remaining: 33m 7s
118:	learn: 0.6456564	total: 4m 27s	remaining: 33m 3s
119:	learn: 0.6456378	total: 4m 30s	remaining: 33m 1s
120:	learn: 0.6455983	total: 4m 32s	remaining: 33m
121:	learn: 0.6455734	total: 4m 35s	remaining: 32m 59s
122:	learn: 0.6455503	total: 4m 37s	remaining: 33m 1s
123:	learn: 0.6455137	total: 4m 40s	remaining: 33m
124:	learn: 0.6454865	total: 4m 42s	remaining: 32m 58s
125:	learn: 0.6454671	total: 4m 45s	remaining: 32m 59s
126:	learn: 0.6454499	total: 4m 47s	remaining: 32m 56s
127:	learn: 0.6454227	total: 4m 50s	remaining: 32m 56s
128:	learn: 0.6453999	total: 4m 52s	remaining: 32m 54s
129:	learn: 0.6453730	total: 4m 55s	remaining: 32m 54s
130:	learn: 0.6453544	total: 4m 57s	remaining: 32m 54s
131:	learn: 0.6453241	total: 4m 59s	remaining: 32m 52s

132:	learn: 0.6452926	total: 5m 2s	remaining: 32m 51s
133:	learn: 0.6452643	total: 5m 4s	remaining: 32m 50s
134:	learn: 0.6452301	total: 5m 7s	remaining: 32m 47s
135:	learn: 0.6452103	total: 5m 9s	remaining: 32m 44s
136:	learn: 0.6451697	total: 5m 11s	remaining: 32m 41s
137:	learn: 0.6451264	total: 5m 13s	remaining: 32m 38s
138:	learn: 0.6450925	total: 5m 15s	remaining: 32m 36s
139:	learn: 0.6450779	total: 5m 18s	remaining: 32m 34s
140:	learn: 0.6450358	total: 5m 20s	remaining: 32m 32s
141:	learn: 0.6450076	total: 5m 22s	remaining: 32m 29s
142:	learn: 0.6449854	total: 5m 24s	remaining: 32m 24s
143:	learn: 0.6449758	total: 5m 26s	remaining: 32m 21s
144:	learn: 0.6449483	total: 5m 28s	remaining: 32m 17s
145:	learn: 0.6449152	total: 5m 30s	remaining: 32m 14s
146:	learn: 0.6448992	total: 5m 32s	remaining: 32m 11s
147:	learn: 0.6448759	total: 5m 35s	remaining: 32m 9s
148:	learn: 0.6448563	total: 5m 37s	remaining: 32m 7s
149:	learn: 0.6448401	total: 5m 39s	remaining: 32m 6s
150:	learn: 0.6448230	total: 5m 42s	remaining: 32m 3s
151:	learn: 0.6447969	total: 5m 44s	remaining: 32m 1s
152:	learn: 0.6447827	total: 5m 46s	remaining: 31m 58s
153:	learn: 0.6447709	total: 5m 48s	remaining: 31m 57s
154:	learn: 0.6447605	total: 5m 51s	remaining: 31m 54s
155:	learn: 0.6447425	total: 5m 53s	remaining: 31m 52s
156:	learn: 0.6447311	total: 5m 55s	remaining: 31m 49s
157:	learn: 0.6447078	total: 5m 57s	remaining: 31m 46s
158:	learn: 0.6446810	total: 5m 59s	remaining: 31m 44s
159:	learn: 0.6446708	total: 6m 2s	remaining: 31m 41s
160:	learn: 0.6446494	total: 6m 4s	remaining: 31m 39s
161:	learn: 0.6446408	total: 6m 6s	remaining: 31m 34s
162:	learn: 0.6446309	total: 6m 8s	remaining: 31m 30s
163:	learn: 0.6446204	total: 6m 10s	remaining: 31m 28s
164:	learn: 0.6445972	total: 6m 12s	remaining: 31m 26s
165:	learn: 0.6445781	total: 6m 15s	remaining: 31m 24s
166:	learn: 0.6445650	total: 6m 17s	remaining: 31m 21s
167:	learn: 0.6445541	total: 6m 19s	remaining: 31m 19s
168:	learn: 0.6445316	total: 6m 21s	remaining: 31m 16s
169:	learn: 0.6445254	total: 6m 23s	remaining: 31m 13s
170:	learn: 0.6445073	total: 6m 25s	remaining: 31m 10s
171:	learn: 0.6444816	total: 6m 28s	remaining: 31m 8s
172:	learn: 0.6444620	total: 6m 30s	remaining: 31m 6s
173:	learn: 0.6444481	total: 6m 32s	remaining: 31m 4s
174:	learn: 0.6444295	total: 6m 35s	remaining: 31m 3s
175:	learn: 0.6444193	total: 6m 37s	remaining: 31m 1s
176:	learn: 0.6444047	total: 6m 40s	remaining: 31m
177:	learn: 0.6443817	total: 6m 42s	remaining: 30m 57s
178:	learn: 0.6443572	total: 6m 44s	remaining: 30m 55s
179:	learn: 0.6443365	total: 6m 46s	remaining: 30m 52s

180:	learn: 0.6443117	total: 6m 48s	remaining: 30m 49s
181:	learn: 0.6442884	total: 6m 51s	remaining: 30m 47s
182:	learn: 0.6442710	total: 6m 53s	remaining: 30m 46s
183:	learn: 0.6442513	total: 6m 55s	remaining: 30m 44s
184:	learn: 0.6442431	total: 6m 57s	remaining: 30m 41s
185:	learn: 0.6442238	total: 7m	remaining: 30m 38s
186:	learn: 0.6442015	total: 7m 2s	remaining: 30m 36s
187:	learn: 0.6441694	total: 7m 4s	remaining: 30m 32s
188:	learn: 0.6441523	total: 7m 6s	remaining: 30m 29s
189:	learn: 0.6441293	total: 7m 8s	remaining: 30m 27s
190:	learn: 0.6441138	total: 7m 10s	remaining: 30m 25s
191:	learn: 0.6440959	total: 7m 13s	remaining: 30m 22s
192:	learn: 0.6440798	total: 7m 15s	remaining: 30m 20s
193:	learn: 0.6440643	total: 7m 17s	remaining: 30m 17s
194:	learn: 0.6440444	total: 7m 19s	remaining: 30m 15s
195:	learn: 0.6440266	total: 7m 22s	remaining: 30m 13s
196:	learn: 0.6440112	total: 7m 24s	remaining: 30m 11s
197:	learn: 0.6439995	total: 7m 26s	remaining: 30m 9s
198:	learn: 0.6439874	total: 7m 28s	remaining: 30m 7s
199:	learn: 0.6439620	total: 7m 31s	remaining: 30m 5s
200:	learn: 0.6439479	total: 7m 33s	remaining: 30m 3s
201:	learn: 0.6439225	total: 7m 35s	remaining: 30m 1s
202:	learn: 0.6439091	total: 7m 38s	remaining: 29m 59s
203:	learn: 0.6438964	total: 7m 40s	remaining: 29m 56s
204:	learn: 0.6438746	total: 7m 42s	remaining: 29m 53s
205:	learn: 0.6438513	total: 7m 44s	remaining: 29m 51s
206:	learn: 0.6438377	total: 7m 46s	remaining: 29m 48s
207:	learn: 0.6438206	total: 7m 49s	remaining: 29m 46s
208:	learn: 0.6438027	total: 7m 51s	remaining: 29m 43s
209:	learn: 0.6437901	total: 7m 53s	remaining: 29m 41s
210:	learn: 0.6437815	total: 7m 55s	remaining: 29m 38s
211:	learn: 0.6437673	total: 7m 57s	remaining: 29m 36s
212:	learn: 0.6437523	total: 8m	remaining: 29m 33s
213:	learn: 0.6437344	total: 8m 2s	remaining: 29m 31s
214:	learn: 0.6437183	total: 8m 4s	remaining: 29m 28s
215:	learn: 0.6437100	total: 8m 6s	remaining: 29m 25s
216:	learn: 0.6436899	total: 8m 8s	remaining: 29m 23s
217:	learn: 0.6436826	total: 8m 10s	remaining: 29m 21s
218:	learn: 0.6436622	total: 8m 13s	remaining: 29m 18s
219:	learn: 0.6436497	total: 8m 14s	remaining: 29m 14s
220:	learn: 0.6436386	total: 8m 17s	remaining: 29m 12s
221:	learn: 0.6436265	total: 8m 19s	remaining: 29m 9s
222:	learn: 0.6436114	total: 8m 21s	remaining: 29m 7s
223:	learn: 0.6435979	total: 8m 23s	remaining: 29m 5s
224:	learn: 0.6435799	total: 8m 25s	remaining: 29m 2s
225:	learn: 0.6435737	total: 8m 28s	remaining: 28m 59s
226:	learn: 0.6435648	total: 8m 30s	remaining: 28m 58s
227:	learn: 0.6435526	total: 8m 32s	remaining: 28m 56s

228:	learn: 0.6435355	total: 8m 34s	remaining: 28m 53s
229:	learn: 0.6435283	total: 8m 36s	remaining: 28m 50s
230:	learn: 0.6435166	total: 8m 38s	remaining: 28m 46s
231:	learn: 0.6435029	total: 8m 41s	remaining: 28m 44s
232:	learn: 0.6434797	total: 8m 43s	remaining: 28m 42s
233:	learn: 0.6434694	total: 8m 45s	remaining: 28m 39s
234:	learn: 0.6434551	total: 8m 47s	remaining: 28m 36s
235:	learn: 0.6434474	total: 8m 49s	remaining: 28m 34s
236:	learn: 0.6434314	total: 8m 51s	remaining: 28m 31s
237:	learn: 0.6434107	total: 8m 53s	remaining: 28m 29s
238:	learn: 0.6433998	total: 8m 56s	remaining: 28m 27s
239:	learn: 0.6433880	total: 8m 58s	remaining: 28m 25s
240:	learn: 0.6433811	total: 9m	remaining: 28m 22s
241:	learn: 0.6433733	total: 9m 2s	remaining: 28m 20s
242:	learn: 0.6433640	total: 9m 4s	remaining: 28m 17s
243:	learn: 0.6433458	total: 9m 7s	remaining: 28m 15s
244:	learn: 0.6433386	total: 9m 9s	remaining: 28m 13s
245:	learn: 0.6433329	total: 9m 11s	remaining: 28m 11s
246:	learn: 0.6433186	total: 9m 14s	remaining: 28m 9s
247:	learn: 0.6433091	total: 9m 16s	remaining: 28m 6s
248:	learn: 0.6432978	total: 9m 18s	remaining: 28m 4s
249:	learn: 0.6432905	total: 9m 20s	remaining: 28m 2s
250:	learn: 0.6432843	total: 9m 23s	remaining: 28m
251:	learn: 0.6432735	total: 9m 25s	remaining: 27m 58s
252:	learn: 0.6432666	total: 9m 27s	remaining: 27m 56s
253:	learn: 0.6432543	total: 9m 30s	remaining: 27m 54s
254:	learn: 0.6432415	total: 9m 32s	remaining: 27m 51s
255:	learn: 0.6432279	total: 9m 34s	remaining: 27m 49s
256:	learn: 0.6432177	total: 9m 36s	remaining: 27m 47s
257:	learn: 0.6432038	total: 9m 39s	remaining: 27m 45s
258:	learn: 0.6431927	total: 9m 41s	remaining: 27m 43s
259:	learn: 0.6431773	total: 9m 43s	remaining: 27m 40s
260:	learn: 0.6431711	total: 9m 45s	remaining: 27m 38s
261:	learn: 0.6431568	total: 9m 48s	remaining: 27m 36s
262:	learn: 0.6431426	total: 9m 50s	remaining: 27m 34s
263:	learn: 0.6431299	total: 9m 52s	remaining: 27m 32s
264:	learn: 0.6431143	total: 9m 54s	remaining: 27m 30s
265:	learn: 0.6431050	total: 9m 57s	remaining: 27m 27s
266:	learn: 0.6430849	total: 9m 59s	remaining: 27m 25s
267:	learn: 0.6430744	total: 10m 1s	remaining: 27m 23s
268:	learn: 0.6430580	total: 10m 4s	remaining: 27m 21s
269:	learn: 0.6430445	total: 10m 6s	remaining: 27m 18s
270:	learn: 0.6430328	total: 10m 8s	remaining: 27m 16s
271:	learn: 0.6430222	total: 10m 10s	remaining: 27m 14s
272:	learn: 0.6430145	total: 10m 13s	remaining: 27m 12s
273:	learn: 0.6429941	total: 10m 15s	remaining: 27m 9s
274:	learn: 0.6429836	total: 10m 17s	remaining: 27m 7s
275:	learn: 0.6429693	total: 10m 19s	remaining: 27m 4s

276:	learn: 0.6429593	total: 10m 21s	remaining: 27m 1s
277:	learn: 0.6429484	total: 10m 23s	remaining: 26m 59s
278:	learn: 0.6429413	total: 10m 25s	remaining: 26m 56s
279:	learn: 0.6429334	total: 10m 27s	remaining: 26m 54s
280:	learn: 0.6429206	total: 10m 30s	remaining: 26m 52s
281:	learn: 0.6429134	total: 10m 32s	remaining: 26m 50s
282:	learn: 0.6429079	total: 10m 34s	remaining: 26m 47s
283:	learn: 0.6428988	total: 10m 36s	remaining: 26m 45s
284:	learn: 0.6428835	total: 10m 38s	remaining: 26m 42s
285:	learn: 0.6428748	total: 10m 41s	remaining: 26m 40s
286:	learn: 0.6428611	total: 10m 43s	remaining: 26m 38s
287:	learn: 0.6428488	total: 10m 45s	remaining: 26m 36s
288:	learn: 0.6428406	total: 10m 47s	remaining: 26m 33s
289:	learn: 0.6428334	total: 10m 50s	remaining: 26m 31s
290:	learn: 0.6428175	total: 10m 52s	remaining: 26m 29s
291:	learn: 0.6428110	total: 10m 54s	remaining: 26m 26s
292:	learn: 0.6427849	total: 10m 56s	remaining: 26m 24s
293:	learn: 0.6427735	total: 10m 58s	remaining: 26m 21s
294:	learn: 0.6427643	total: 11m	remaining: 26m 18s
295:	learn: 0.6427452	total: 11m 2s	remaining: 26m 16s
296:	learn: 0.6427390	total: 11m 4s	remaining: 26m 13s
297:	learn: 0.6427263	total: 11m 7s	remaining: 26m 11s
298:	learn: 0.6427173	total: 11m 9s	remaining: 26m 9s
299:	learn: 0.6427106	total: 11m 11s	remaining: 26m 6s
300:	learn: 0.6426986	total: 11m 13s	remaining: 26m 4s
301:	learn: 0.6426903	total: 11m 15s	remaining: 26m 2s
302:	learn: 0.6426757	total: 11m 18s	remaining: 26m
303:	learn: 0.6426668	total: 11m 20s	remaining: 25m 57s
304:	learn: 0.6426611	total: 11m 22s	remaining: 25m 56s
305:	learn: 0.6426504	total: 11m 25s	remaining: 25m 54s
306:	learn: 0.6426358	total: 11m 27s	remaining: 25m 51s
307:	learn: 0.6426283	total: 11m 29s	remaining: 25m 50s
308:	learn: 0.6426189	total: 11m 32s	remaining: 25m 47s
309:	learn: 0.6426063	total: 11m 34s	remaining: 25m 45s
310:	learn: 0.6425982	total: 11m 36s	remaining: 25m 43s
311:	learn: 0.6425883	total: 11m 38s	remaining: 25m 40s
312:	learn: 0.6425831	total: 11m 41s	remaining: 25m 38s
313:	learn: 0.6425746	total: 11m 43s	remaining: 25m 36s
314:	learn: 0.6425711	total: 11m 45s	remaining: 25m 34s
315:	learn: 0.6425554	total: 11m 47s	remaining: 25m 31s
316:	learn: 0.6425223	total: 11m 50s	remaining: 25m 29s
317:	learn: 0.6425103	total: 11m 52s	remaining: 25m 27s
318:	learn: 0.6424970	total: 11m 54s	remaining: 25m 24s
319:	learn: 0.6424909	total: 11m 56s	remaining: 25m 22s
320:	learn: 0.6424868	total: 11m 58s	remaining: 25m 20s
321:	learn: 0.6424847	total: 12m 1s	remaining: 25m 18s
322:	learn: 0.6424808	total: 12m 3s	remaining: 25m 15s
323:	learn: 0.6424712	total: 12m 5s	remaining: 25m 13s

324:	learn: 0.6424581	total: 12m 7s	remaining: 25m 10s
325:	learn: 0.6424503	total: 12m 9s	remaining: 25m 8s
326:	learn: 0.6424410	total: 12m 11s	remaining: 25m 6s
327:	learn: 0.6424271	total: 12m 13s	remaining: 25m 3s
328:	learn: 0.6424194	total: 12m 16s	remaining: 25m 2s
329:	learn: 0.6424128	total: 12m 18s	remaining: 24m 59s
330:	learn: 0.6424052	total: 12m 21s	remaining: 24m 57s
331:	learn: 0.6423985	total: 12m 23s	remaining: 24m 55s
332:	learn: 0.6423858	total: 12m 25s	remaining: 24m 53s
333:	learn: 0.6423789	total: 12m 27s	remaining: 24m 50s
334:	learn: 0.6423709	total: 12m 29s	remaining: 24m 48s
335:	learn: 0.6423673	total: 12m 31s	remaining: 24m 46s
336:	learn: 0.6423607	total: 12m 34s	remaining: 24m 44s
337:	learn: 0.6423579	total: 12m 36s	remaining: 24m 41s
338:	learn: 0.6423398	total: 12m 38s	remaining: 24m 38s
339:	learn: 0.6423266	total: 12m 40s	remaining: 24m 36s
340:	learn: 0.6423196	total: 12m 43s	remaining: 24m 34s
341:	learn: 0.6423112	total: 12m 45s	remaining: 24m 32s
342:	learn: 0.6423022	total: 12m 47s	remaining: 24m 30s
343:	learn: 0.6422997	total: 12m 49s	remaining: 24m 28s
344:	learn: 0.6422857	total: 12m 52s	remaining: 24m 25s
345:	learn: 0.6422806	total: 12m 53s	remaining: 24m 22s
346:	learn: 0.6422763	total: 12m 56s	remaining: 24m 20s
347:	learn: 0.6422710	total: 12m 58s	remaining: 24m 18s
348:	learn: 0.6422663	total: 13m 1s	remaining: 24m 16s
349:	learn: 0.6422588	total: 13m 3s	remaining: 24m 14s
350:	learn: 0.6422478	total: 13m 5s	remaining: 24m 12s
351:	learn: 0.6422335	total: 13m 8s	remaining: 24m 11s
352:	learn: 0.6422322	total: 13m 10s	remaining: 24m 8s
353:	learn: 0.6422247	total: 13m 13s	remaining: 24m 7s
354:	learn: 0.6422165	total: 13m 15s	remaining: 24m 5s
355:	learn: 0.6422077	total: 13m 18s	remaining: 24m 3s
356:	learn: 0.6422024	total: 13m 20s	remaining: 24m 1s
357:	learn: 0.6421992	total: 13m 23s	remaining: 24m
358:	learn: 0.6421920	total: 13m 25s	remaining: 23m 59s
359:	learn: 0.6421812	total: 13m 28s	remaining: 23m 56s
360:	learn: 0.6421761	total: 13m 30s	remaining: 23m 54s
361:	learn: 0.6421700	total: 13m 32s	remaining: 23m 52s
362:	learn: 0.6421612	total: 13m 34s	remaining: 23m 50s
363:	learn: 0.6421497	total: 13m 36s	remaining: 23m 47s
364:	learn: 0.6421413	total: 13m 39s	remaining: 23m 45s
365:	learn: 0.6421336	total: 13m 41s	remaining: 23m 42s
366:	learn: 0.6421253	total: 13m 43s	remaining: 23m 40s
367:	learn: 0.6421106	total: 13m 45s	remaining: 23m 38s
368:	learn: 0.6420936	total: 13m 47s	remaining: 23m 35s
369:	learn: 0.6420827	total: 13m 50s	remaining: 23m 33s
370:	learn: 0.6420628	total: 13m 52s	remaining: 23m 31s
371:	learn: 0.6420522	total: 13m 54s	remaining: 23m 29s

372:	learn: 0.6420458	total: 13m 56s	remaining: 23m 26s
373:	learn: 0.6420410	total: 13m 58s	remaining: 23m 24s
374:	learn: 0.6420367	total: 14m	remaining: 23m 21s
375:	learn: 0.6420306	total: 14m 2s	remaining: 23m 19s
376:	learn: 0.6420189	total: 14m 5s	remaining: 23m 16s
377:	learn: 0.6420095	total: 14m 7s	remaining: 23m 14s
378:	learn: 0.6420017	total: 14m 9s	remaining: 23m 11s
379:	learn: 0.6419940	total: 14m 11s	remaining: 23m 9s
380:	learn: 0.6419899	total: 14m 14s	remaining: 23m 7s
381:	learn: 0.6419830	total: 14m 16s	remaining: 23m 5s
382:	learn: 0.6419743	total: 14m 18s	remaining: 23m 3s
383:	learn: 0.6419660	total: 14m 20s	remaining: 23m
384:	learn: 0.6419585	total: 14m 23s	remaining: 22m 58s
385:	learn: 0.6419504	total: 14m 25s	remaining: 22m 56s
386:	learn: 0.6419418	total: 14m 27s	remaining: 22m 53s
387:	learn: 0.6419338	total: 14m 29s	remaining: 22m 51s
388:	learn: 0.6419224	total: 14m 32s	remaining: 22m 49s
389:	learn: 0.6419140	total: 14m 34s	remaining: 22m 47s
390:	learn: 0.6419093	total: 14m 36s	remaining: 22m 45s
391:	learn: 0.6419088	total: 14m 38s	remaining: 22m 43s
392:	learn: 0.6418993	total: 14m 41s	remaining: 22m 40s
393:	learn: 0.6418928	total: 14m 43s	remaining: 22m 38s
394:	learn: 0.6418861	total: 14m 45s	remaining: 22m 36s
395:	learn: 0.6418763	total: 14m 48s	remaining: 22m 34s
396:	learn: 0.6418722	total: 14m 50s	remaining: 22m 32s
397:	learn: 0.6418632	total: 14m 53s	remaining: 22m 30s
398:	learn: 0.6418521	total: 14m 55s	remaining: 22m 28s
399:	learn: 0.6418446	total: 14m 57s	remaining: 22m 26s
400:	learn: 0.6418376	total: 15m	remaining: 22m 24s
401:	learn: 0.6418289	total: 15m 2s	remaining: 22m 22s
402:	learn: 0.6418182	total: 15m 4s	remaining: 22m 20s
403:	learn: 0.6418140	total: 15m 6s	remaining: 22m 18s
404:	learn: 0.6418044	total: 15m 9s	remaining: 22m 15s
405:	learn: 0.6417966	total: 15m 11s	remaining: 22m 13s
406:	learn: 0.6417908	total: 15m 13s	remaining: 22m 11s
407:	learn: 0.6417822	total: 15m 16s	remaining: 22m 9s
408:	learn: 0.6417709	total: 15m 18s	remaining: 22m 7s
409:	learn: 0.6417639	total: 15m 20s	remaining: 22m 4s
410:	learn: 0.6417599	total: 15m 23s	remaining: 22m 2s
411:	learn: 0.6417507	total: 15m 25s	remaining: 22m
412:	learn: 0.6417339	total: 15m 27s	remaining: 21m 58s
413:	learn: 0.6417278	total: 15m 30s	remaining: 21m 56s
414:	learn: 0.6417179	total: 15m 32s	remaining: 21m 54s
415:	learn: 0.6417070	total: 15m 34s	remaining: 21m 51s
416:	learn: 0.6416987	total: 15m 36s	remaining: 21m 49s
417:	learn: 0.6416923	total: 15m 39s	remaining: 21m 47s
418:	learn: 0.6416847	total: 15m 41s	remaining: 21m 45s
419:	learn: 0.6416806	total: 15m 43s	remaining: 21m 43s

420:	learn: 0.6416725	total: 15m 46s	remaining: 21m 41s
421:	learn: 0.6416648	total: 15m 48s	remaining: 21m 38s
422:	learn: 0.6416557	total: 15m 50s	remaining: 21m 36s
423:	learn: 0.6416502	total: 15m 52s	remaining: 21m 34s
424:	learn: 0.6416411	total: 15m 54s	remaining: 21m 31s
425:	learn: 0.6416321	total: 15m 56s	remaining: 21m 29s
426:	learn: 0.6416269	total: 15m 59s	remaining: 21m 27s
427:	learn: 0.6416223	total: 16m 1s	remaining: 21m 24s
428:	learn: 0.6416118	total: 16m 3s	remaining: 21m 21s
429:	learn: 0.6416018	total: 16m 5s	remaining: 21m 19s
430:	learn: 0.6415980	total: 16m 7s	remaining: 21m 17s
431:	learn: 0.6415942	total: 16m 9s	remaining: 21m 15s
432:	learn: 0.6415904	total: 16m 11s	remaining: 21m 12s
433:	learn: 0.6415758	total: 16m 14s	remaining: 21m 10s
434:	learn: 0.6415641	total: 16m 16s	remaining: 21m 8s
435:	learn: 0.6415582	total: 16m 18s	remaining: 21m 5s
436:	learn: 0.6415492	total: 16m 20s	remaining: 21m 3s
437:	learn: 0.6415438	total: 16m 23s	remaining: 21m 1s
438:	learn: 0.6415350	total: 16m 25s	remaining: 20m 59s
439:	learn: 0.6415268	total: 16m 27s	remaining: 20m 56s
440:	learn: 0.6415226	total: 16m 29s	remaining: 20m 54s
441:	learn: 0.6415175	total: 16m 32s	remaining: 20m 52s
442:	learn: 0.6415124	total: 16m 34s	remaining: 20m 50s
443:	learn: 0.6415088	total: 16m 36s	remaining: 20m 47s
444:	learn: 0.6414931	total: 16m 38s	remaining: 20m 45s
445:	learn: 0.6414864	total: 16m 41s	remaining: 20m 43s
446:	learn: 0.6414762	total: 16m 43s	remaining: 20m 41s
447:	learn: 0.6414666	total: 16m 45s	remaining: 20m 38s
448:	learn: 0.6414615	total: 16m 47s	remaining: 20m 36s
449:	learn: 0.6414534	total: 16m 50s	remaining: 20m 34s
450:	learn: 0.6414465	total: 16m 52s	remaining: 20m 32s
451:	learn: 0.6414361	total: 16m 54s	remaining: 20m 30s
452:	learn: 0.6414297	total: 16m 57s	remaining: 20m 28s
453:	learn: 0.6414278	total: 16m 59s	remaining: 20m 26s
454:	learn: 0.6414253	total: 17m 1s	remaining: 20m 23s
455:	learn: 0.6414224	total: 17m 3s	remaining: 20m 21s
456:	learn: 0.6414167	total: 17m 5s	remaining: 20m 19s
457:	learn: 0.6414125	total: 17m 7s	remaining: 20m 16s
458:	learn: 0.6414058	total: 17m 10s	remaining: 20m 14s
459:	learn: 0.6413982	total: 17m 12s	remaining: 20m 12s
460:	learn: 0.6413946	total: 17m 14s	remaining: 20m 9s
461:	learn: 0.6413837	total: 17m 17s	remaining: 20m 7s
462:	learn: 0.6413769	total: 17m 19s	remaining: 20m 5s
463:	learn: 0.6413707	total: 17m 21s	remaining: 20m 3s
464:	learn: 0.6413611	total: 17m 23s	remaining: 20m
465:	learn: 0.6413508	total: 17m 25s	remaining: 19m 58s
466:	learn: 0.6413434	total: 17m 28s	remaining: 19m 56s
467:	learn: 0.6413402	total: 17m 30s	remaining: 19m 54s

468:	learn: 0.6413315	total: 17m 32s	remaining: 19m 51s
469:	learn: 0.6413237	total: 17m 35s	remaining: 19m 49s
470:	learn: 0.6413151	total: 17m 36s	remaining: 19m 47s
471:	learn: 0.6413093	total: 17m 39s	remaining: 19m 44s
472:	learn: 0.6413060	total: 17m 41s	remaining: 19m 42s
473:	learn: 0.6412973	total: 17m 43s	remaining: 19m 40s
474:	learn: 0.6412924	total: 17m 45s	remaining: 19m 38s
475:	learn: 0.6412862	total: 17m 48s	remaining: 19m 35s
476:	learn: 0.6412805	total: 17m 50s	remaining: 19m 33s
477:	learn: 0.6412794	total: 17m 52s	remaining: 19m 31s
478:	learn: 0.6412730	total: 17m 55s	remaining: 19m 29s
479:	learn: 0.6412648	total: 17m 57s	remaining: 19m 26s
480:	learn: 0.6412552	total: 17m 59s	remaining: 19m 24s
481:	learn: 0.6412536	total: 18m 1s	remaining: 19m 22s
482:	learn: 0.6412430	total: 18m 3s	remaining: 19m 20s
483:	learn: 0.6412405	total: 18m 6s	remaining: 19m 17s
484:	learn: 0.6412303	total: 18m 8s	remaining: 19m 15s
485:	learn: 0.6412198	total: 18m 10s	remaining: 19m 13s
486:	learn: 0.6412155	total: 18m 12s	remaining: 19m 10s
487:	learn: 0.6412034	total: 18m 14s	remaining: 19m 8s
488:	learn: 0.6411981	total: 18m 17s	remaining: 19m 6s
489:	learn: 0.6411926	total: 18m 19s	remaining: 19m 4s
490:	learn: 0.6411872	total: 18m 21s	remaining: 19m 1s
491:	learn: 0.6411834	total: 18m 24s	remaining: 18m 59s
492:	learn: 0.6411781	total: 18m 26s	remaining: 18m 57s
493:	learn: 0.6411712	total: 18m 28s	remaining: 18m 55s
494:	learn: 0.6411636	total: 18m 31s	remaining: 18m 53s
495:	learn: 0.6411606	total: 18m 33s	remaining: 18m 51s
496:	learn: 0.6411521	total: 18m 35s	remaining: 18m 49s
497:	learn: 0.6411454	total: 18m 38s	remaining: 18m 47s
498:	learn: 0.6411372	total: 18m 40s	remaining: 18m 44s
499:	learn: 0.6411304	total: 18m 42s	remaining: 18m 42s
500:	learn: 0.6411277	total: 18m 44s	remaining: 18m 40s
501:	learn: 0.6411197	total: 18m 46s	remaining: 18m 37s
502:	learn: 0.6411156	total: 18m 48s	remaining: 18m 35s
503:	learn: 0.6411107	total: 18m 51s	remaining: 18m 33s
504:	learn: 0.6411079	total: 18m 53s	remaining: 18m 31s
505:	learn: 0.6411053	total: 18m 56s	remaining: 18m 29s
506:	learn: 0.6410973	total: 18m 58s	remaining: 18m 26s
507:	learn: 0.6410918	total: 19m	remaining: 18m 24s
508:	learn: 0.6410853	total: 19m 2s	remaining: 18m 22s
509:	learn: 0.6410780	total: 19m 5s	remaining: 18m 20s
510:	learn: 0.6410712	total: 19m 7s	remaining: 18m 17s
511:	learn: 0.6410626	total: 19m 9s	remaining: 18m 15s
512:	learn: 0.6410523	total: 19m 11s	remaining: 18m 13s
513:	learn: 0.6410451	total: 19m 13s	remaining: 18m 11s
514:	learn: 0.6410386	total: 19m 16s	remaining: 18m 8s
515:	learn: 0.6410321	total: 19m 18s	remaining: 18m 6s

516:	learn: 0.6410259	total: 19m 20s	remaining: 18m 4s
517:	learn: 0.6410214	total: 19m 22s	remaining: 18m 2s
518:	learn: 0.6410105	total: 19m 25s	remaining: 17m 59s
519:	learn: 0.6410033	total: 19m 27s	remaining: 17m 57s
520:	learn: 0.6409984	total: 19m 29s	remaining: 17m 55s
521:	learn: 0.6409899	total: 19m 32s	remaining: 17m 53s
522:	learn: 0.6409844	total: 19m 34s	remaining: 17m 51s
523:	learn: 0.6409802	total: 19m 36s	remaining: 17m 48s
524:	learn: 0.6409775	total: 19m 38s	remaining: 17m 46s
525:	learn: 0.6409710	total: 19m 41s	remaining: 17m 44s
526:	learn: 0.6409670	total: 19m 43s	remaining: 17m 42s
527:	learn: 0.6409579	total: 19m 45s	remaining: 17m 40s
528:	learn: 0.6409529	total: 19m 48s	remaining: 17m 37s
529:	learn: 0.6409487	total: 19m 50s	remaining: 17m 35s
530:	learn: 0.6409451	total: 19m 52s	remaining: 17m 33s
531:	learn: 0.6409359	total: 19m 55s	remaining: 17m 31s
532:	learn: 0.6409332	total: 19m 57s	remaining: 17m 29s
533:	learn: 0.6409255	total: 19m 59s	remaining: 17m 27s
534:	learn: 0.6409208	total: 20m 2s	remaining: 17m 24s
535:	learn: 0.6409181	total: 20m 4s	remaining: 17m 22s
536:	learn: 0.6409135	total: 20m 6s	remaining: 17m 20s
537:	learn: 0.6409047	total: 20m 9s	remaining: 17m 18s
538:	learn: 0.6408978	total: 20m 11s	remaining: 17m 16s
539:	learn: 0.6408921	total: 20m 14s	remaining: 17m 14s
540:	learn: 0.6408869	total: 20m 16s	remaining: 17m 11s
541:	learn: 0.6408793	total: 20m 18s	remaining: 17m 9s
542:	learn: 0.6408761	total: 20m 20s	remaining: 17m 7s
543:	learn: 0.6408731	total: 20m 22s	remaining: 17m 4s
544:	learn: 0.6408684	total: 20m 24s	remaining: 17m 2s
545:	learn: 0.6408616	total: 20m 26s	remaining: 17m
546:	learn: 0.6408514	total: 20m 28s	remaining: 16m 57s
547:	learn: 0.6408485	total: 20m 31s	remaining: 16m 55s
548:	learn: 0.6408433	total: 20m 33s	remaining: 16m 53s
549:	learn: 0.6408318	total: 20m 35s	remaining: 16m 51s
550:	learn: 0.6408296	total: 20m 37s	remaining: 16m 48s
551:	learn: 0.6408262	total: 20m 40s	remaining: 16m 46s
552:	learn: 0.6408207	total: 20m 42s	remaining: 16m 44s
553:	learn: 0.6408140	total: 20m 44s	remaining: 16m 41s
554:	learn: 0.6408108	total: 20m 47s	remaining: 16m 39s
555:	learn: 0.6408007	total: 20m 49s	remaining: 16m 37s
556:	learn: 0.6407924	total: 20m 51s	remaining: 16m 35s
557:	learn: 0.6407847	total: 20m 53s	remaining: 16m 33s
558:	learn: 0.6407750	total: 20m 55s	remaining: 16m 30s
559:	learn: 0.6407725	total: 20m 58s	remaining: 16m 28s
560:	learn: 0.6407641	total: 21m	remaining: 16m 26s
561:	learn: 0.6407559	total: 21m 2s	remaining: 16m 24s
562:	learn: 0.6407457	total: 21m 4s	remaining: 16m 21s
563:	learn: 0.6407412	total: 21m 7s	remaining: 16m 19s

564:	learn: 0.6407334	total: 21m 9s	remaining: 16m 17s
565:	learn: 0.6407271	total: 21m 11s	remaining: 16m 15s
566:	learn: 0.6407196	total: 21m 13s	remaining: 16m 12s
567:	learn: 0.6407132	total: 21m 16s	remaining: 16m 10s
568:	learn: 0.6407106	total: 21m 18s	remaining: 16m 8s
569:	learn: 0.6407029	total: 21m 20s	remaining: 16m 6s
570:	learn: 0.6406942	total: 21m 22s	remaining: 16m 3s
571:	learn: 0.6406897	total: 21m 25s	remaining: 16m 1s
572:	learn: 0.6406803	total: 21m 27s	remaining: 15m 59s
573:	learn: 0.6406711	total: 21m 29s	remaining: 15m 57s
574:	learn: 0.6406639	total: 21m 31s	remaining: 15m 54s
575:	learn: 0.6406615	total: 21m 33s	remaining: 15m 52s
576:	learn: 0.6406553	total: 21m 35s	remaining: 15m 49s
577:	learn: 0.6406504	total: 21m 38s	remaining: 15m 47s
578:	learn: 0.6406423	total: 21m 40s	remaining: 15m 45s
579:	learn: 0.6406393	total: 21m 42s	remaining: 15m 43s
580:	learn: 0.6406360	total: 21m 44s	remaining: 15m 40s
581:	learn: 0.6406310	total: 21m 46s	remaining: 15m 38s
582:	learn: 0.6406297	total: 21m 48s	remaining: 15m 36s
583:	learn: 0.6406263	total: 21m 51s	remaining: 15m 34s
584:	learn: 0.6406238	total: 21m 53s	remaining: 15m 31s
585:	learn: 0.6406182	total: 21m 55s	remaining: 15m 29s
586:	learn: 0.6406160	total: 21m 57s	remaining: 15m 26s
587:	learn: 0.6406123	total: 21m 59s	remaining: 15m 24s
588:	learn: 0.6406025	total: 22m 1s	remaining: 15m 22s
589:	learn: 0.6405964	total: 22m 4s	remaining: 15m 20s
590:	learn: 0.6405916	total: 22m 6s	remaining: 15m 18s
591:	learn: 0.6405897	total: 22m 8s	remaining: 15m 15s
592:	learn: 0.6405883	total: 22m 11s	remaining: 15m 13s
593:	learn: 0.6405870	total: 22m 13s	remaining: 15m 11s
594:	learn: 0.6405864	total: 22m 15s	remaining: 15m 8s
595:	learn: 0.6405800	total: 22m 17s	remaining: 15m 6s
596:	learn: 0.6405772	total: 22m 19s	remaining: 15m 4s
597:	learn: 0.6405712	total: 22m 22s	remaining: 15m 2s
598:	learn: 0.6405659	total: 22m 24s	remaining: 15m
599:	learn: 0.6405625	total: 22m 26s	remaining: 14m 57s
600:	learn: 0.6405571	total: 22m 28s	remaining: 14m 55s
601:	learn: 0.6405522	total: 22m 30s	remaining: 14m 53s
602:	learn: 0.6405484	total: 22m 32s	remaining: 14m 50s
603:	learn: 0.6405474	total: 22m 34s	remaining: 14m 48s
604:	learn: 0.6405400	total: 22m 37s	remaining: 14m 46s
605:	learn: 0.6405373	total: 22m 39s	remaining: 14m 43s
606:	learn: 0.6405296	total: 22m 41s	remaining: 14m 41s
607:	learn: 0.6405171	total: 22m 43s	remaining: 14m 39s
608:	learn: 0.6405147	total: 22m 46s	remaining: 14m 37s
609:	learn: 0.6405073	total: 22m 48s	remaining: 14m 34s
610:	learn: 0.6405052	total: 22m 50s	remaining: 14m 32s
611:	learn: 0.6404995	total: 22m 52s	remaining: 14m 30s

612:	learn: 0.6404944	total: 22m 55s	remaining: 14m 28s
613:	learn: 0.6404913	total: 22m 57s	remaining: 14m 26s
614:	learn: 0.6404901	total: 22m 59s	remaining: 14m 23s
615:	learn: 0.6404801	total: 23m 1s	remaining: 14m 21s
616:	learn: 0.6404778	total: 23m 3s	remaining: 14m 18s
617:	learn: 0.6404702	total: 23m 5s	remaining: 14m 16s
618:	learn: 0.6404661	total: 23m 8s	remaining: 14m 14s
619:	learn: 0.6404618	total: 23m 10s	remaining: 14m 12s
620:	learn: 0.6404530	total: 23m 12s	remaining: 14m 9s
621:	learn: 0.6404490	total: 23m 15s	remaining: 14m 7s
622:	learn: 0.6404428	total: 23m 17s	remaining: 14m 5s
623:	learn: 0.6404383	total: 23m 20s	remaining: 14m 3s
624:	learn: 0.6404258	total: 23m 22s	remaining: 14m 1s
625:	learn: 0.6404236	total: 23m 25s	remaining: 13m 59s
626:	learn: 0.6404216	total: 23m 27s	remaining: 13m 57s
627:	learn: 0.6404148	total: 23m 29s	remaining: 13m 54s
628:	learn: 0.6404114	total: 23m 31s	remaining: 13m 52s
629:	learn: 0.6404049	total: 23m 34s	remaining: 13m 50s
630:	learn: 0.6404028	total: 23m 35s	remaining: 13m 48s
631:	learn: 0.6403981	total: 23m 38s	remaining: 13m 45s
632:	learn: 0.6403909	total: 23m 40s	remaining: 13m 43s
633:	learn: 0.6403878	total: 23m 42s	remaining: 13m 41s
634:	learn: 0.6403814	total: 23m 44s	remaining: 13m 39s
635:	learn: 0.6403742	total: 23m 47s	remaining: 13m 36s
636:	learn: 0.6403684	total: 23m 49s	remaining: 13m 34s
637:	learn: 0.6403644	total: 23m 52s	remaining: 13m 32s
638:	learn: 0.6403608	total: 23m 54s	remaining: 13m 30s
639:	learn: 0.6403581	total: 23m 56s	remaining: 13m 28s
640:	learn: 0.6403555	total: 23m 59s	remaining: 13m 26s
641:	learn: 0.6403533	total: 24m 1s	remaining: 13m 23s
642:	learn: 0.6403486	total: 24m 3s	remaining: 13m 21s
643:	learn: 0.6403421	total: 24m 5s	remaining: 13m 19s
644:	learn: 0.6403351	total: 24m 7s	remaining: 13m 16s
645:	learn: 0.6403351	total: 24m 9s	remaining: 13m 14s
646:	learn: 0.6403309	total: 24m 11s	remaining: 13m 12s
647:	learn: 0.6403233	total: 24m 14s	remaining: 13m 9s
648:	learn: 0.6403164	total: 24m 16s	remaining: 13m 7s
649:	learn: 0.6403092	total: 24m 18s	remaining: 13m 5s
650:	learn: 0.6403071	total: 24m 20s	remaining: 13m 3s
651:	learn: 0.6403004	total: 24m 22s	remaining: 13m
652:	learn: 0.6402951	total: 24m 25s	remaining: 12m 58s
653:	learn: 0.6402911	total: 24m 27s	remaining: 12m 56s
654:	learn: 0.6402856	total: 24m 29s	remaining: 12m 54s
655:	learn: 0.6402782	total: 24m 31s	remaining: 12m 51s
656:	learn: 0.6402724	total: 24m 33s	remaining: 12m 49s
657:	learn: 0.6402651	total: 24m 35s	remaining: 12m 47s
658:	learn: 0.6402586	total: 24m 37s	remaining: 12m 44s
659:	learn: 0.6402513	total: 24m 40s	remaining: 12m 42s

660:	learn: 0.6402491	total: 24m 42s	remaining: 12m 40s
661:	learn: 0.6402469	total: 24m 44s	remaining: 12m 38s
662:	learn: 0.6402379	total: 24m 47s	remaining: 12m 35s
663:	learn: 0.6402349	total: 24m 49s	remaining: 12m 33s
664:	learn: 0.6402339	total: 24m 51s	remaining: 12m 31s
665:	learn: 0.6402291	total: 24m 53s	remaining: 12m 29s
666:	learn: 0.6402240	total: 24m 56s	remaining: 12m 26s
667:	learn: 0.6402217	total: 24m 58s	remaining: 12m 24s
668:	learn: 0.6402148	total: 25m	remaining: 12m 22s
669:	learn: 0.6402083	total: 25m 2s	remaining: 12m 20s
670:	learn: 0.6402062	total: 25m 4s	remaining: 12m 17s
671:	learn: 0.6402009	total: 25m 6s	remaining: 12m 15s
672:	learn: 0.6401931	total: 25m 9s	remaining: 12m 13s
673:	learn: 0.6401916	total: 25m 11s	remaining: 12m 11s
674:	learn: 0.6401846	total: 25m 13s	remaining: 12m 8s
675:	learn: 0.6401751	total: 25m 16s	remaining: 12m 6s
676:	learn: 0.6401744	total: 25m 18s	remaining: 12m 4s
677:	learn: 0.6401727	total: 25m 20s	remaining: 12m 2s
678:	learn: 0.6401702	total: 25m 22s	remaining: 11m 59s
679:	learn: 0.6401648	total: 25m 25s	remaining: 11m 57s
680:	learn: 0.6401621	total: 25m 27s	remaining: 11m 55s
681:	learn: 0.6401564	total: 25m 29s	remaining: 11m 53s
682:	learn: 0.6401540	total: 25m 31s	remaining: 11m 50s
683:	learn: 0.6401476	total: 25m 33s	remaining: 11m 48s
684:	learn: 0.6401411	total: 25m 36s	remaining: 11m 46s
685:	learn: 0.6401360	total: 25m 38s	remaining: 11m 44s
686:	learn: 0.6401317	total: 25m 41s	remaining: 11m 42s
687:	learn: 0.6401304	total: 25m 43s	remaining: 11m 39s
688:	learn: 0.6401237	total: 25m 45s	remaining: 11m 37s
689:	learn: 0.6401156	total: 25m 48s	remaining: 11m 35s
690:	learn: 0.6401099	total: 25m 50s	remaining: 11m 33s
691:	learn: 0.6401065	total: 25m 52s	remaining: 11m 31s
692:	learn: 0.6401007	total: 25m 55s	remaining: 11m 28s
693:	learn: 0.6400989	total: 25m 57s	remaining: 11m 26s
694:	learn: 0.6400931	total: 25m 59s	remaining: 11m 24s
695:	learn: 0.6400891	total: 26m 2s	remaining: 11m 22s
696:	learn: 0.6400839	total: 26m 4s	remaining: 11m 20s
697:	learn: 0.6400773	total: 26m 6s	remaining: 11m 17s
698:	learn: 0.6400739	total: 26m 8s	remaining: 11m 15s
699:	learn: 0.6400686	total: 26m 11s	remaining: 11m 13s
700:	learn: 0.6400635	total: 26m 13s	remaining: 11m 11s
701:	learn: 0.6400572	total: 26m 15s	remaining: 11m 8s
702:	learn: 0.6400528	total: 26m 18s	remaining: 11m 6s
703:	learn: 0.6400471	total: 26m 20s	remaining: 11m 4s
704:	learn: 0.6400395	total: 26m 22s	remaining: 11m 2s
705:	learn: 0.6400358	total: 26m 24s	remaining: 10m 59s
706:	learn: 0.6400300	total: 26m 26s	remaining: 10m 57s
707:	learn: 0.6400275	total: 26m 29s	remaining: 10m 55s

708:	learn: 0.6400225	total: 26m 31s	remaining: 10m 53s
709:	learn: 0.6400187	total: 26m 33s	remaining: 10m 50s
710:	learn: 0.6400136	total: 26m 35s	remaining: 10m 48s
711:	learn: 0.6400115	total: 26m 38s	remaining: 10m 46s
712:	learn: 0.6400089	total: 26m 40s	remaining: 10m 44s
713:	learn: 0.6400038	total: 26m 42s	remaining: 10m 41s
714:	learn: 0.6399940	total: 26m 44s	remaining: 10m 39s
715:	learn: 0.6399927	total: 26m 47s	remaining: 10m 37s
716:	learn: 0.6399881	total: 26m 49s	remaining: 10m 35s
717:	learn: 0.6399857	total: 26m 51s	remaining: 10m 33s
718:	learn: 0.6399806	total: 26m 54s	remaining: 10m 30s
719:	learn: 0.6399771	total: 26m 56s	remaining: 10m 28s
720:	learn: 0.6399712	total: 26m 58s	remaining: 10m 26s
721:	learn: 0.6399667	total: 27m	remaining: 10m 24s
722:	learn: 0.6399556	total: 27m 2s	remaining: 10m 21s
723:	learn: 0.6399499	total: 27m 5s	remaining: 10m 19s
724:	learn: 0.6399457	total: 27m 7s	remaining: 10m 17s
725:	learn: 0.6399439	total: 27m 9s	remaining: 10m 15s
726:	learn: 0.6399408	total: 27m 11s	remaining: 10m 12s
727:	learn: 0.6399388	total: 27m 13s	remaining: 10m 10s
728:	learn: 0.6399322	total: 27m 15s	remaining: 10m 8s
729:	learn: 0.6399299	total: 27m 18s	remaining: 10m 5s
730:	learn: 0.6399198	total: 27m 20s	remaining: 10m 3s
731:	learn: 0.6399092	total: 27m 22s	remaining: 10m 1s
732:	learn: 0.6399015	total: 27m 24s	remaining: 9m 58s
733:	learn: 0.6398947	total: 27m 26s	remaining: 9m 56s
734:	learn: 0.6398907	total: 27m 28s	remaining: 9m 54s
735:	learn: 0.6398890	total: 27m 31s	remaining: 9m 52s
736:	learn: 0.6398825	total: 27m 33s	remaining: 9m 49s
737:	learn: 0.6398729	total: 27m 35s	remaining: 9m 47s
738:	learn: 0.6398639	total: 27m 37s	remaining: 9m 45s
739:	learn: 0.6398562	total: 27m 40s	remaining: 9m 43s
740:	learn: 0.6398522	total: 27m 42s	remaining: 9m 40s
741:	learn: 0.6398484	total: 27m 44s	remaining: 9m 38s
742:	learn: 0.6398469	total: 27m 46s	remaining: 9m 36s
743:	learn: 0.6398422	total: 27m 48s	remaining: 9m 34s
744:	learn: 0.6398409	total: 27m 51s	remaining: 9m 32s
745:	learn: 0.6398354	total: 27m 53s	remaining: 9m 29s
746:	learn: 0.6398305	total: 27m 56s	remaining: 9m 27s
747:	learn: 0.6398271	total: 27m 58s	remaining: 9m 25s
748:	learn: 0.6398228	total: 28m	remaining: 9m 23s
749:	learn: 0.6398180	total: 28m 2s	remaining: 9m 20s
750:	learn: 0.6398136	total: 28m 4s	remaining: 9m 18s
751:	learn: 0.6398078	total: 28m 7s	remaining: 9m 16s
752:	learn: 0.6398061	total: 28m 9s	remaining: 9m 14s
753:	learn: 0.6398004	total: 28m 11s	remaining: 9m 11s
754:	learn: 0.6397948	total: 28m 13s	remaining: 9m 9s
755:	learn: 0.6397858	total: 28m 16s	remaining: 9m 7s

756:	learn: 0.6397829	total: 28m 18s	remaining: 9m 5s
757:	learn: 0.6397777	total: 28m 20s	remaining: 9m 3s
758:	learn: 0.6397720	total: 28m 23s	remaining: 9m
759:	learn: 0.6397696	total: 28m 25s	remaining: 8m 58s
760:	learn: 0.6397667	total: 28m 27s	remaining: 8m 56s
761:	learn: 0.6397621	total: 28m 30s	remaining: 8m 54s
762:	learn: 0.6397487	total: 28m 32s	remaining: 8m 52s
763:	learn: 0.6397461	total: 28m 35s	remaining: 8m 49s
764:	learn: 0.6397411	total: 28m 37s	remaining: 8m 47s
765:	learn: 0.6397371	total: 28m 39s	remaining: 8m 45s
766:	learn: 0.6397305	total: 28m 41s	remaining: 8m 43s
767:	learn: 0.6397247	total: 28m 44s	remaining: 8m 40s
768:	learn: 0.6397171	total: 28m 46s	remaining: 8m 38s
769:	learn: 0.6397141	total: 28m 48s	remaining: 8m 36s
770:	learn: 0.6397129	total: 28m 51s	remaining: 8m 34s
771:	learn: 0.6397095	total: 28m 53s	remaining: 8m 31s
772:	learn: 0.6397060	total: 28m 55s	remaining: 8m 29s
773:	learn: 0.6397013	total: 28m 57s	remaining: 8m 27s
774:	learn: 0.6396993	total: 29m	remaining: 8m 25s
775:	learn: 0.6396967	total: 29m 2s	remaining: 8m 22s
776:	learn: 0.6396920	total: 29m 4s	remaining: 8m 20s
777:	learn: 0.6396875	total: 29m 6s	remaining: 8m 18s
778:	learn: 0.6396808	total: 29m 8s	remaining: 8m 16s
779:	learn: 0.6396775	total: 29m 11s	remaining: 8m 13s
780:	learn: 0.6396733	total: 29m 13s	remaining: 8m 11s
781:	learn: 0.6396682	total: 29m 15s	remaining: 8m 9s
782:	learn: 0.6396659	total: 29m 18s	remaining: 8m 7s
783:	learn: 0.6396599	total: 29m 20s	remaining: 8m 5s
784:	learn: 0.6396560	total: 29m 22s	remaining: 8m 2s
785:	learn: 0.6396549	total: 29m 25s	remaining: 8m
786:	learn: 0.6396478	total: 29m 27s	remaining: 7m 58s
787:	learn: 0.6396427	total: 29m 30s	remaining: 7m 56s
788:	learn: 0.6396395	total: 29m 32s	remaining: 7m 54s
789:	learn: 0.6396352	total: 29m 35s	remaining: 7m 51s
790:	learn: 0.6396328	total: 29m 37s	remaining: 7m 49s
791:	learn: 0.6396277	total: 29m 39s	remaining: 7m 47s
792:	learn: 0.6396204	total: 29m 41s	remaining: 7m 44s
793:	learn: 0.6396172	total: 29m 43s	remaining: 7m 42s
794:	learn: 0.6396141	total: 29m 45s	remaining: 7m 40s
795:	learn: 0.6396093	total: 29m 48s	remaining: 7m 38s
796:	learn: 0.6396060	total: 29m 50s	remaining: 7m 36s
797:	learn: 0.6396016	total: 29m 52s	remaining: 7m 33s
798:	learn: 0.6395981	total: 29m 54s	remaining: 7m 31s
799:	learn: 0.6395951	total: 29m 57s	remaining: 7m 29s
800:	learn: 0.6395879	total: 29m 59s	remaining: 7m 27s
801:	learn: 0.6395852	total: 30m 1s	remaining: 7m 24s
802:	learn: 0.6395806	total: 30m 3s	remaining: 7m 22s
803:	learn: 0.6395776	total: 30m 5s	remaining: 7m 20s

804:	learn: 0.6395751	total: 30m 8s	remaining: 7m 18s
805:	learn: 0.6395714	total: 30m 10s	remaining: 7m 15s
806:	learn: 0.6395693	total: 30m 12s	remaining: 7m 13s
807:	learn: 0.6395622	total: 30m 15s	remaining: 7m 11s
808:	learn: 0.6395572	total: 30m 18s	remaining: 7m 9s
809:	learn: 0.6395543	total: 30m 20s	remaining: 7m 7s
810:	learn: 0.6395505	total: 30m 23s	remaining: 7m 4s
811:	learn: 0.6395492	total: 30m 25s	remaining: 7m 2s
812:	learn: 0.6395454	total: 30m 28s	remaining: 7m
813:	learn: 0.6395427	total: 30m 30s	remaining: 6m 58s
814:	learn: 0.6395401	total: 30m 33s	remaining: 6m 56s
815:	learn: 0.6395382	total: 30m 35s	remaining: 6m 53s
816:	learn: 0.6395316	total: 30m 38s	remaining: 6m 51s
817:	learn: 0.6395242	total: 30m 40s	remaining: 6m 49s
818:	learn: 0.6395228	total: 30m 42s	remaining: 6m 47s
819:	learn: 0.6395115	total: 30m 44s	remaining: 6m 44s
820:	learn: 0.6395082	total: 30m 47s	remaining: 6m 42s
821:	learn: 0.6395057	total: 30m 49s	remaining: 6m 40s
822:	learn: 0.6395038	total: 30m 52s	remaining: 6m 38s
823:	learn: 0.6394950	total: 30m 54s	remaining: 6m 36s
824:	learn: 0.6394903	total: 30m 56s	remaining: 6m 33s
825:	learn: 0.6394856	total: 30m 59s	remaining: 6m 31s
826:	learn: 0.6394791	total: 31m 1s	remaining: 6m 29s
827:	learn: 0.6394775	total: 31m 3s	remaining: 6m 27s
828:	learn: 0.6394758	total: 31m 6s	remaining: 6m 24s
829:	learn: 0.6394678	total: 31m 8s	remaining: 6m 22s
830:	learn: 0.6394647	total: 31m 10s	remaining: 6m 20s
831:	learn: 0.6394611	total: 31m 13s	remaining: 6m 18s
832:	learn: 0.6394545	total: 31m 15s	remaining: 6m 15s
833:	learn: 0.6394514	total: 31m 17s	remaining: 6m 13s
834:	learn: 0.6394456	total: 31m 19s	remaining: 6m 11s
835:	learn: 0.6394435	total: 31m 22s	remaining: 6m 9s
836:	learn: 0.6394405	total: 31m 24s	remaining: 6m 6s
837:	learn: 0.6394366	total: 31m 27s	remaining: 6m 4s
838:	learn: 0.6394301	total: 31m 29s	remaining: 6m 2s
839:	learn: 0.6394267	total: 31m 32s	remaining: 6m
840:	learn: 0.6394254	total: 31m 34s	remaining: 5m 58s
841:	learn: 0.6394227	total: 31m 36s	remaining: 5m 55s
842:	learn: 0.6394193	total: 31m 38s	remaining: 5m 53s
843:	learn: 0.6394104	total: 31m 41s	remaining: 5m 51s
844:	learn: 0.6394065	total: 31m 43s	remaining: 5m 49s
845:	learn: 0.6393990	total: 31m 45s	remaining: 5m 46s
846:	learn: 0.6393944	total: 31m 48s	remaining: 5m 44s
847:	learn: 0.6393911	total: 31m 50s	remaining: 5m 42s
848:	learn: 0.6393876	total: 31m 53s	remaining: 5m 40s
849:	learn: 0.6393837	total: 31m 55s	remaining: 5m 37s
850:	learn: 0.6393830	total: 31m 57s	remaining: 5m 35s
851:	learn: 0.6393770	total: 31m 59s	remaining: 5m 33s

852:	learn: 0.6393715	total: 32m 2s	remaining: 5m 31s
853:	learn: 0.6393672	total: 32m 4s	remaining: 5m 29s
854:	learn: 0.6393660	total: 32m 6s	remaining: 5m 26s
855:	learn: 0.6393632	total: 32m 8s	remaining: 5m 24s
856:	learn: 0.6393610	total: 32m 11s	remaining: 5m 22s
857:	learn: 0.6393513	total: 32m 13s	remaining: 5m 19s
858:	learn: 0.6393462	total: 32m 15s	remaining: 5m 17s
859:	learn: 0.6393432	total: 32m 17s	remaining: 5m 15s
860:	learn: 0.6393415	total: 32m 20s	remaining: 5m 13s
861:	learn: 0.6393351	total: 32m 22s	remaining: 5m 10s
862:	learn: 0.6393306	total: 32m 24s	remaining: 5m 8s
863:	learn: 0.6393266	total: 32m 26s	remaining: 5m 6s
864:	learn: 0.6393236	total: 32m 28s	remaining: 5m 4s
865:	learn: 0.6393205	total: 32m 31s	remaining: 5m 1s
866:	learn: 0.6393145	total: 32m 33s	remaining: 4m 59s
867:	learn: 0.6393110	total: 32m 35s	remaining: 4m 57s
868:	learn: 0.6393079	total: 32m 38s	remaining: 4m 55s
869:	learn: 0.6393041	total: 32m 40s	remaining: 4m 52s
870:	learn: 0.6393025	total: 32m 42s	remaining: 4m 50s
871:	learn: 0.6393008	total: 32m 44s	remaining: 4m 48s
872:	learn: 0.6392937	total: 32m 46s	remaining: 4m 46s
873:	learn: 0.6392880	total: 32m 48s	remaining: 4m 43s
874:	learn: 0.6392875	total: 32m 51s	remaining: 4m 41s
875:	learn: 0.6392829	total: 32m 53s	remaining: 4m 39s
876:	learn: 0.6392786	total: 32m 56s	remaining: 4m 37s
877:	learn: 0.6392704	total: 32m 58s	remaining: 4m 34s
878:	learn: 0.6392642	total: 33m	remaining: 4m 32s
879:	learn: 0.6392609	total: 33m 3s	remaining: 4m 30s
880:	learn: 0.6392552	total: 33m 5s	remaining: 4m 28s
881:	learn: 0.6392527	total: 33m 7s	remaining: 4m 25s
882:	learn: 0.6392489	total: 33m 10s	remaining: 4m 23s
883:	learn: 0.6392444	total: 33m 12s	remaining: 4m 21s
884:	learn: 0.6392396	total: 33m 14s	remaining: 4m 19s
885:	learn: 0.6392346	total: 33m 16s	remaining: 4m 16s
886:	learn: 0.6392311	total: 33m 19s	remaining: 4m 14s
887:	learn: 0.6392260	total: 33m 21s	remaining: 4m 12s
888:	learn: 0.6392239	total: 33m 24s	remaining: 4m 10s
889:	learn: 0.6392222	total: 33m 26s	remaining: 4m 8s
890:	learn: 0.6392158	total: 33m 29s	remaining: 4m 5s
891:	learn: 0.6392120	total: 33m 31s	remaining: 4m 3s
892:	learn: 0.6392056	total: 33m 33s	remaining: 4m 1s
893:	learn: 0.6392019	total: 33m 36s	remaining: 3m 59s
894:	learn: 0.6391997	total: 33m 38s	remaining: 3m 56s
895:	learn: 0.6391964	total: 33m 41s	remaining: 3m 54s
896:	learn: 0.6391914	total: 33m 43s	remaining: 3m 52s
897:	learn: 0.6391870	total: 33m 46s	remaining: 3m 50s
898:	learn: 0.6391821	total: 33m 49s	remaining: 3m 47s
899:	learn: 0.6391746	total: 33m 51s	remaining: 3m 45s

900:	learn: 0.6391687	total: 33m 53s	remaining: 3m 43s
901:	learn: 0.6391641	total: 33m 56s	remaining: 3m 41s
902:	learn: 0.6391586	total: 33m 58s	remaining: 3m 38s
903:	learn: 0.6391560	total: 34m	remaining: 3m 36s
904:	learn: 0.6391494	total: 34m 2s	remaining: 3m 34s
905:	learn: 0.6391449	total: 34m 4s	remaining: 3m 32s
906:	learn: 0.6391405	total: 34m 6s	remaining: 3m 29s
907:	learn: 0.6391344	total: 34m 9s	remaining: 3m 27s
908:	learn: 0.6391263	total: 34m 11s	remaining: 3m 25s
909:	learn: 0.6391187	total: 34m 14s	remaining: 3m 23s
910:	learn: 0.6391127	total: 34m 16s	remaining: 3m 20s
911:	learn: 0.6391060	total: 34m 19s	remaining: 3m 18s
912:	learn: 0.6391045	total: 34m 22s	remaining: 3m 16s
913:	learn: 0.6391011	total: 34m 24s	remaining: 3m 14s
914:	learn: 0.6390974	total: 34m 26s	remaining: 3m 12s
915:	learn: 0.6390914	total: 34m 29s	remaining: 3m 9s
916:	learn: 0.6390839	total: 34m 31s	remaining: 3m 7s
917:	learn: 0.6390802	total: 34m 34s	remaining: 3m 5s
918:	learn: 0.6390789	total: 34m 36s	remaining: 3m 3s
919:	learn: 0.6390761	total: 34m 39s	remaining: 3m
920:	learn: 0.6390752	total: 34m 41s	remaining: 2m 58s
921:	learn: 0.6390707	total: 34m 44s	remaining: 2m 56s
922:	learn: 0.6390652	total: 34m 47s	remaining: 2m 54s
923:	learn: 0.6390615	total: 34m 49s	remaining: 2m 51s
924:	learn: 0.6390556	total: 34m 52s	remaining: 2m 49s
925:	learn: 0.6390515	total: 34m 54s	remaining: 2m 47s
926:	learn: 0.6390461	total: 34m 57s	remaining: 2m 45s
927:	learn: 0.6390441	total: 34m 59s	remaining: 2m 42s
928:	learn: 0.6390408	total: 35m 1s	remaining: 2m 40s
929:	learn: 0.6390375	total: 35m 4s	remaining: 2m 38s
930:	learn: 0.6390365	total: 35m 6s	remaining: 2m 36s
931:	learn: 0.6390345	total: 35m 9s	remaining: 2m 33s
932:	learn: 0.6390304	total: 35m 11s	remaining: 2m 31s
933:	learn: 0.6390273	total: 35m 13s	remaining: 2m 29s
934:	learn: 0.6390200	total: 35m 16s	remaining: 2m 27s
935:	learn: 0.6390165	total: 35m 18s	remaining: 2m 24s
936:	learn: 0.6390138	total: 35m 20s	remaining: 2m 22s
937:	learn: 0.6390089	total: 35m 22s	remaining: 2m 20s
938:	learn: 0.6390002	total: 35m 24s	remaining: 2m 18s
939:	learn: 0.6389960	total: 35m 27s	remaining: 2m 15s
940:	learn: 0.6389909	total: 35m 29s	remaining: 2m 13s
941:	learn: 0.6389862	total: 35m 31s	remaining: 2m 11s
942:	learn: 0.6389809	total: 35m 33s	remaining: 2m 8s
943:	learn: 0.6389755	total: 35m 35s	remaining: 2m 6s
944:	learn: 0.6389736	total: 35m 37s	remaining: 2m 4s
945:	learn: 0.6389706	total: 35m 39s	remaining: 2m 2s
946:	learn: 0.6389678	total: 35m 41s	remaining: 1m 59s
947:	learn: 0.6389629	total: 35m 44s	remaining: 1m 57s

948:	learn: 0.6389603	total: 35m 46s	remaining: 1m 55s
949:	learn: 0.6389575	total: 35m 48s	remaining: 1m 53s
950:	learn: 0.6389507	total: 35m 50s	remaining: 1m 50s
951:	learn: 0.6389465	total: 35m 53s	remaining: 1m 48s
952:	learn: 0.6389407	total: 35m 55s	remaining: 1m 46s
953:	learn: 0.6389366	total: 35m 57s	remaining: 1m 44s
954:	learn: 0.6389347	total: 36m	remaining: 1m 41s
955:	learn: 0.6389283	total: 36m 2s	remaining: 1m 39s
956:	learn: 0.6389266	total: 36m 4s	remaining: 1m 37s
957:	learn: 0.6389212	total: 36m 6s	remaining: 1m 34s
958:	learn: 0.6389196	total: 36m 9s	remaining: 1m 32s
959:	learn: 0.6389163	total: 36m 11s	remaining: 1m 30s
960:	learn: 0.6389115	total: 36m 13s	remaining: 1m 28s
961:	learn: 0.6389065	total: 36m 16s	remaining: 1m 25s
962:	learn: 0.6389019	total: 36m 18s	remaining: 1m 23s
963:	learn: 0.6388987	total: 36m 20s	remaining: 1m 21s
964:	learn: 0.6388948	total: 36m 22s	remaining: 1m 19s
965:	learn: 0.6388927	total: 36m 25s	remaining: 1m 16s
966:	learn: 0.6388884	total: 36m 27s	remaining: 1m 14s
967:	learn: 0.6388845	total: 36m 30s	remaining: 1m 12s
968:	learn: 0.6388777	total: 36m 32s	remaining: 1m 10s
969:	learn: 0.6388724	total: 36m 34s	remaining: 1m 7s
970:	learn: 0.6388690	total: 36m 37s	remaining: 1m 5s
971:	learn: 0.6388624	total: 36m 39s	remaining: 1m 3s
972:	learn: 0.6388578	total: 36m 41s	remaining: 1m 1s
973:	learn: 0.6388563	total: 36m 43s	remaining: 58.8s
974:	learn: 0.6388543	total: 36m 45s	remaining: 56.6s
975:	learn: 0.6388486	total: 36m 47s	remaining: 54.3s
976:	learn: 0.6388445	total: 36m 50s	remaining: 52s
977:	learn: 0.6388385	total: 36m 52s	remaining: 49.8s
978:	learn: 0.6388362	total: 36m 55s	remaining: 47.5s
979:	learn: 0.6388349	total: 36m 57s	remaining: 45.3s
980:	learn: 0.6388342	total: 36m 59s	remaining: 43s
981:	learn: 0.6388287	total: 37m 1s	remaining: 40.7s
982:	learn: 0.6388237	total: 37m 4s	remaining: 38.5s
983:	learn: 0.6388213	total: 37m 6s	remaining: 36.2s
984:	learn: 0.6388192	total: 37m 8s	remaining: 33.9s
985:	learn: 0.6388137	total: 37m 11s	remaining: 31.7s
986:	learn: 0.6388102	total: 37m 13s	remaining: 29.4s
987:	learn: 0.6388069	total: 37m 16s	remaining: 27.2s
988:	learn: 0.6388046	total: 37m 18s	remaining: 24.9s
989:	learn: 0.6388024	total: 37m 20s	remaining: 22.6s
990:	learn: 0.6387988	total: 37m 23s	remaining: 20.4s
991:	learn: 0.6387967	total: 37m 25s	remaining: 18.1s
992:	learn: 0.6387929	total: 37m 28s	remaining: 15.8s
993:	learn: 0.6387916	total: 37m 31s	remaining: 13.6s
994:	learn: 0.6387881	total: 37m 33s	remaining: 11.3s
995:	learn: 0.6387838	total: 37m 36s	remaining: 9.06s

```

996:    learn: 0.6387791          total: 37m 39s  remaining: 6.8s
997:    learn: 0.6387771          total: 37m 41s  remaining: 4.53s
998:    learn: 0.6387734          total: 37m 44s  remaining: 2.27s
999:    learn: 0.6387667          total: 37m 47s  remaining: 0us
CPU times: user 6h 56min 17s, sys: 5min 41s, total: 7h 1min 58s
Wall time: 38min 14s

```

```

[28]: %%time

# Predict class
pred_train = cat_boost.predict(X_train)
pred_test = cat_boost.predict(X_test)

# Predict probability
pred_score_train = cat_boost.predict_proba(X_train)[:, 1]
pred_score_test = cat_boost.predict_proba(X_test)[:, 1]

print('Accuracy in training set: {:.3f}'.format(accuracy_score(y_train,
    ↪pred_train)))
print('Accuracy in testing set: {:.3f}'.format(accuracy_score(y_test,
    ↪pred_test)))

print('\nAUC in training set: {:.3f}'.format(roc_auc_score(y_train,
    ↪pred_score_train)))
print('AUC in testing set: {:.3f}'.format(roc_auc_score(y_test,
    ↪pred_score_test)))

```

```

Accuracy in training set: 0.633
Accuracy in testing set: 0.629

```

```

AUC in training set: 0.684
AUC in testing set: 0.677
CPU times: user 3min 19s, sys: 2.23 s, total: 3min 21s
Wall time: 46.3 s

```

```

[29]: %%script false --no-raise-error

# Prediction score/probability
pred_score_test = cat_boost.predict_proba(X_test)[:, 1]

fpr, tpr, thresholds = roc_curve(y_test, pred_score_test)
auc_score = roc_auc_score(y_test, pred_score_test)

def plot_roc_curve(fpr, tpr, auc_score, legend=None):
    plt.plot(fpr, tpr, linewidth=2, c='red')
    plt.plot([0, 1], [0, 1], 'k--')
    plt.xlabel('False Positive Rate')

```

```

plt.ylabel('True Positive Rate')
plt.xlim([0, 1])
plt.ylim([0, 1])
plt.legend(['{}', AUC: {:.2f}'].format(legend, auc_score), 'CatBoost'],
loc='lower right')
plt.title('ROC Curve', weight='bold')

plot_roc_curve(fpr, tpr, auc_score, 'CatBoost')

# Confusion matrix
def plot_confusion_matrix(cm, classes,
                          normalize=False,
                          title='Confusion matrix',
                          cmap=plt.cm.Blues):
    """
    This function prints and plots the confusion matrix.
    Normalization can be applied by setting `normalize=True`.
    """
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(classes))
    plt.xticks(tick_marks, classes, rotation=45)
    plt.yticks(tick_marks, classes)

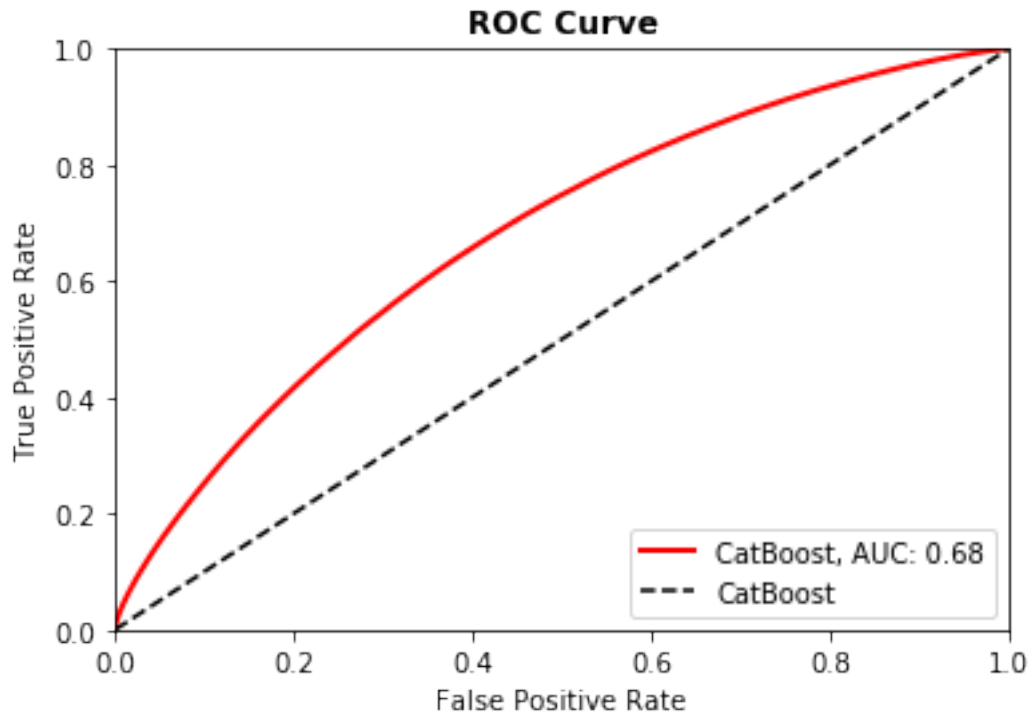
    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
        cm = np.round(cm, 2)
        print("Normalized confusion matrix")
    else:
        print('Confusion matrix, without normalization')

    print(cm)

    thresh = cm.max() / 2.
    for i in range (cm.shape[0]):
        for j in range (cm.shape[1]):
            plt.text(j, i, cm[i, j],
                    horizontalalignment="center",
                    color="white" if cm[i, j] > thresh else "black")

    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted label')

```



```
[30]: %%script false --no-raise-error

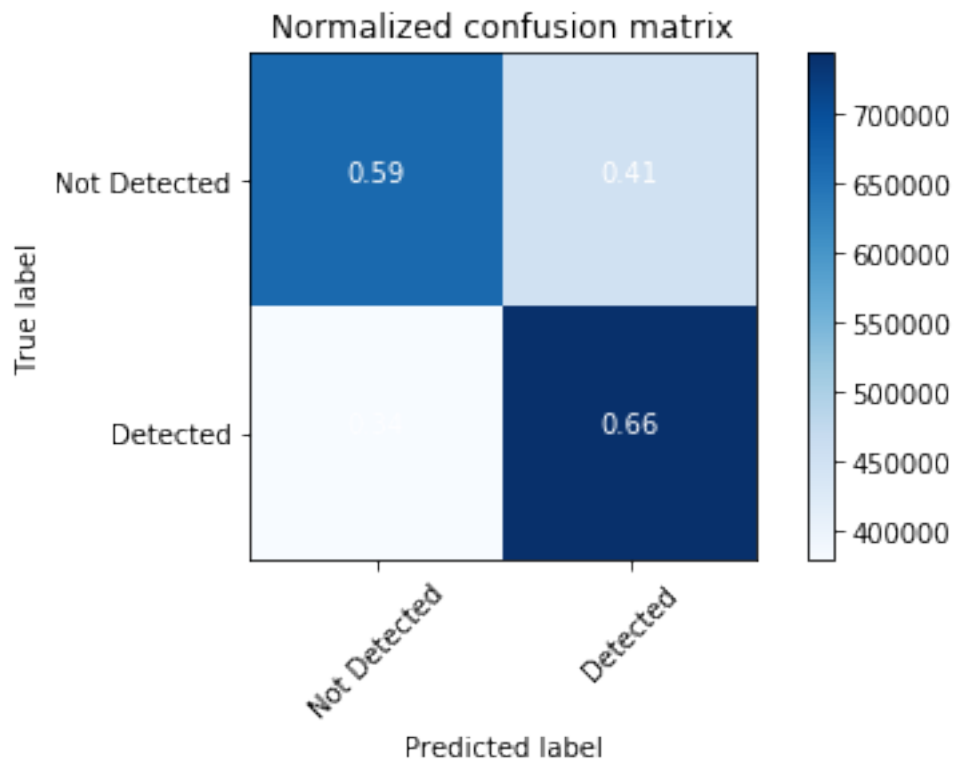
y_pred = pred_test
class_names = ['Not Detected', 'Detected']

# Compute confusion matrix
cm = confusion_matrix(y_test, y_pred)

# Plot confusion matrix
plt.figure()
plot_confusion_matrix(cm, classes=class_names, normalize=True,
                      title='Normalized confusion matrix')

plt.show()
```

```
Normalized confusion matrix
[[0.59 0.41]
 [0.34 0.66]]
```



[]: