

```
In [144]: import random
import numpy as np
import pandas as pd
from sklearn.impute import SimpleImputer
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, classification_report
from catboost import CatBoostClassifier

pd.set_option('display.max_columns', None)
```

Hotel Properties

Load data and examine

Lets load the properties data

```
In [145]: fhr_properties = pd.read_csv('../..//fhr_property_data.csv', index_col=0)
```

```
In [146]: fhr_properties.shape
```

```
Out[146]: (1945, 36)
```

```
In [147]: fhr_properties.nunique()
```

```
Out[147]: name                1944
          supp_id             1945
          brand_id             66
          brand_name           68
          marketing_brand_id    93
          marketing_brand_name  92
          status                1
          city_code            0
          city_name            899
          state_code           0
          state_name           206
          region_code          0
          region_name           9
          country_code         0
          country_name         109
          full_address          0
          postal_code          1292
          latitude             0
          longitude            0
          location             0
          website              1857
          teaser               1864
          description          1888
          insider_tip          1888
          where_staying        1888
          where_to_dine        1888
          where_to_relax       1885
          worth_experiencing   1887
          features             1446
          sabre_hod            1944
          cardmember_favorite  2
          is_new               2
          no_online_booking    0
          mkt_dist2airport     178
          airport_name         1129
          airport_code         432
          dtype: int64
```

```
In [148]: fhr_properties.head(5)
```

```
Out[148]:
```

	name	supp_id	brand_id	brand_name	marketing_brand_id	marketing_brand_name	status	city_code	city_name	state_code	st
0	The Peninsula Tokyo	100115	999063.0	Peninsula Hotels	8	The Peninsula Hotels	active	NaN	Tokyo	NaN	
1	Mandarin Oriental, Doha	102051	999058.0	Mandarin Oriental Hotel Group	5	Mandarin Oriental Hotel Group	active	NaN	Doha	NaN	
2	Mandarin Oriental, Marrakech	100255	999058.0	Mandarin Oriental Hotel Group	5	Mandarin Oriental Hotel Group	active	NaN	Marrakech	NaN	
3	Mandarin Oriental Jumeira, Dubai	300705	999058.0	Mandarin Oriental Hotel Group	5	Mandarin Oriental Hotel Group	active	NaN	Dubai	NaN	
4	Mandarin Oriental Pudong, Shanghai	100480	999058.0	Mandarin Oriental Hotel Group	5	Mandarin Oriental Hotel Group	active	NaN	Shanghai	NaN	

Feature Engineering

```
In [149]: fhr_properties['supp_id'] = fhr_properties['supp_id'].astype('str')
fhr_properties['brand_id'] = fhr_properties['brand_id'].astype('str')
fhr_properties['sabre_hod'] = fhr_properties['sabre_hod'].astype('str')
```

Lets drop columns which do not add any value. Also, since we will join with the bookings dataset, these values are already populated.

```
In [150]: fhr_properties.drop(columns=['location', 'city_code', 'state_code', 'region_code', 'country_code',  
                                     'no_online_booking', 'full_address', 'latitude', 'longitude'], inplace=True)
```

```
In [151]: fhr_properties.isna().sum()
```

```
Out[151]: name                0  
         supp_id             0  
         brand_id            0  
         brand_name          1  
         marketing_brand_id   0  
         marketing_brand_name 56  
         status              0  
         city_name           0  
         state_name          1066  
         region_name         2  
         country_name        3  
         postal_code         17  
         website             2  
         teaser              56  
         description          56  
         insider_tip         56  
         where_staying        56  
         where_to_dine        56  
         where_to_relax       56  
         worth_experiencing   56  
         features            0  
         sabre_hod           0  
         cardmember_favorite  56  
         is_new              56  
         mkt_dist2airport     63  
         airport_name         2  
         airport_code         4  
         dtype: int64
```

We see that features is a list of values. We'll encode them into separate features.

```
In [152]: fhr_properties['features'].head()
```

```
Out[152]: 0    ['Business-Friendly', 'Culinary Classes', 'Pet...  
1    ['Business-Friendly', 'Environmental Certifica...  
2    ['Guided Adventures', 'Boutique', 'Culinary Cl...  
3    ['Beachfront', 'Restaurant andor Bar', 'Spa On...  
4    ['Business-Friendly', 'Romantic', 'Metropolita...  
Name: features, dtype: object
```

```
In [153]: features_series = fhr_properties['features'].values
```

```
In [154]: import ast
```

```
features_df = pd.DataFrame(columns = ['supp_id'])
```

```
def get_business_features_list(x):
```

```
    features = x['features']
```

```
    features_list = ast.literal_eval(features)
```

```
    edited_features_list = list()
```

```
    for each_feature in features_list:
```

```
        each_feature_edited = re.sub(r'^A-Za-z0-9 ]+', ' ', each_feature)
```

```
        each_feature_edited_short = [s[0:2] for s in each_feature_edited.split()]
```

```
        edited_features_list.append(''.join(each_feature_edited_short))
```

```
    return edited_features_list
```

```
fhr_properties['features'] = fhr_properties.apply(lambda x: get_business_features_list(x), axis = 1)
```

```
In [155]: import itertools
```

```
features_series = fhr_properties['features'].values
```

```
features_series_set = set(itertools.chain.from_iterable(features_series))
```

```
In [156]: features_series_set
```

```
Out[156]: {'AdOn',  
           'AlIn',  
           'Ar',  
           'Be',  
           'Bo',  
           'BuFr',  
           'CaMeFa',  
           'CaOnSi',  
           'CuCl',  
           'EnCe',  
           'FaFr',  
           'FiCeOnSi',  
           'GoCo',  
           'GuAd',  
           'Hi',  
           'Me',  
           'PeFr',  
           'PoOnSi',  
           'PrSt',  
           'PrVi',  
           'ReanBa',  
           'Ro',  
           'SaEx',  
           'Se',  
           'SkDe',  
           'SpOnSi',  
           'Tr'}
```

```
In [157]: for features_series_item in features_series_set:  
           feature_name = "feature_" + features_series_item  
           fhr_properties[feature_name] = fhr_properties['features'].apply(lambda x: "YES" if features_series_item in x else "NO")
```

```
In [158]: fhr_properties.drop('features', axis=1, inplace=True)
```

```
In [159]: fhr_properties.shape
```

```
Out[159]: (1945, 53)
```

Impute Missing values

Now, lets impute missing values. For continous predictors, we will impute them using mean and for categorical predictors, we will impute them as UNKNOWN

```
In [160]: numeric_cols = fhr_properties.select_dtypes(include=['float', 'int']).columns

          imp_mean = SimpleImputer(strategy='mean')
          fhr_properties[numeric_cols] = imp_mean.fit_transform(fhr_properties[numeric_cols])

In [161]: categorical_cols = fhr_properties.select_dtypes(exclude=['float', 'int']).columns

          fhr_properties[categorical_cols] = fhr_properties[categorical_cols].fillna('UNKNOWN')
```

Spend Information

```
In [162]: cm_spend_statistics = pd.read_csv('.././gms_fhr_2018_spend.csv', index_col=0)

In [163]: cm_spend_statistics = cm_spend_statistics.reset_index(level=0)
```

Mask key fields

Per compliance, the person id and the column names should be masked.

```
In [164]: import hashlib

          cm_spend_statistics['person_id'] = cm_spend_statistics['person_id'].astype(str).apply(lambda x: hashlib.sha256(x.encode()).hexdigest())
```

```
In [165]: new_cols = list()
i = 1
for each_column in cm_spend_statistics.columns:
    if each_column == 'person_id':
        new_cols.append('person_id')
        continue
    new_cols.append("spend_category_" + str(i))
    i += 1
```

```
In [166]: cm_spend_statistics.columns = new_cols
```

```
In [167]: cm_spend_statistics.fillna(0, inplace=True)
```

```
In [168]: cm_spend_statistics.head()
```

Out[168]:

	person_id	spend_category_1	spend_category_2	spend_category_3	spend_category_4	spend
0	2240d727d960026e8e982ff4fd9f66d673180ae20d2261...	0.0	0.0	0.0	0.0	
1	20aead936893202ce9be9325373a03cff3fb22c059af2c...	33.0	0.0	1.0	2.0	
2	4f4a9fe7d3a84ad14a66028f75470c0ca69333d2a5358e...	8.0	0.0	0.0	0.0	
3	05f6cda18ff4fb159539bf9438aa459fd7bdb163fd90c2...	0.0	0.0	0.0	4.0	
4	fa1085d336313893229f09deb6f7f88147f019256a9d69...	0.0	0.0	0.0	0.0	

```
In [169]: cm_spend_statistics.index = cm_spend_statistics.index.astype('str')
```

Get the full training and evaluation dataset

Now, lets load the transaction and the evaluation dataset.

```
In [170]: transaction_df = pd.read_pickle('03fhr_fe2_output.pkl')
eval_transactions = pd.read_pickle('03eval_fe2_output.pkl')
```


Lets now get the full transaction and evaluation dataset by combining the bookings dataset along with the properties and the spend patterns dataset.

```
In [171]: full_dataset = transaction_df.merge(cm_spend_statistics, left_on='person_id', right_on='person_id', how='left').merge(fhr_properties, left_on='vend_cd', right_on='sabre_hod')
```

```
In [172]: full_eval_df = eval_transactions.reset_index().merge(cm_spend_statistics, left_on='person_id', right_on='person_id', how='left').merge(fhr_properties, left_on='vend_cd', right_on='sabre_hod').set_index('record_number').sort_index()
```

```
In [173]: print(full_dataset.shape, full_eval_df.shape)

(998704, 159) (331686, 159)
```

Impute Missing Values

```
In [174]: full_dataset[cm_spend_statistics.columns] = full_dataset[cm_spend_statistics.columns].fillna(0)
full_eval_df[cm_spend_statistics.columns] = full_eval_df[cm_spend_statistics.columns].fillna(0)
```

```
In [175]: cols_with_missingness = full_dataset.columns[full_dataset.isnull().any()]
full_dataset[cols_with_missingness].isnull().mean().sort_values(ascending=False)
```

```
Out[175]: Series([], dtype: float64)
```

```
In [176]: cols_with_missingness = full_eval_df.columns[full_eval_df.isnull().any()]
full_eval_df[cols_with_missingness].isnull().mean().sort_values(ascending=False)
```

```
Out[176]: Series([], dtype: float64)
```

```
In [177]: X = full_dataset.drop(columns='real_transaction')
y = full_dataset['real_transaction']
```

```
In [178]: y.value_counts(normalize = True)
```

```
Out[178]: 0    0.5
          1    0.5
          Name: real_transaction, dtype: float64
```

In [179]: X.describe()

Out[179]:

	trip_day_ct	rm_no	htl_usd_rt	pnr_creat_ts_month	trip_advance_days	seg_lvl_end_month	cmpnt_creat_dt_month
count	998704.000000	998704.000000	998704.000000	998704.000000	998704.000000	998704.000000	998704.000000
mean	2.643187	1.001989	704.923934	5.917690	54.005305	6.314165	6.316990
std	1.778121	0.051648	591.791423	3.524827	62.479917	3.446860	3.301511
min	1.000000	1.000000	0.010000	1.000000	1.000000	1.000000	1.000000
25%	1.000000	1.000000	374.000000	3.000000	10.000000	3.000000	4.000000
50%	2.000000	1.000000	562.460000	5.000000	33.000000	6.000000	6.000000
75%	3.000000	1.000000	844.290000	9.000000	71.000000	9.000000	9.000000
max	65.000000	12.000000	50146.210000	12.000000	829.000000	12.000000	12.000000

In [180]: X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, random_state=21)

```
In [181]: numeric_cols = X_train.select_dtypes(include=['float','int']).columns
numeric_cols
```

```
Out[181]: Index(['trip_day_ct', 'rm_no', 'htl_usd_rt', 'pnr_creat_ts_month',
                'trip_advance_days', 'seg_lvl_end_month', 'cmpnt_creat_dt_month',
                'spend_category_1', 'spend_category_2', 'spend_category_3',
                'spend_category_4', 'spend_category_5', 'spend_category_6',
                'spend_category_7', 'spend_category_8', 'spend_category_9',
                'spend_category_10', 'spend_category_11', 'spend_category_12',
                'spend_category_13', 'spend_category_14', 'spend_category_15',
                'spend_category_16', 'spend_category_17', 'spend_category_18',
                'spend_category_19', 'spend_category_20', 'spend_category_21',
                'spend_category_22', 'spend_category_23', 'spend_category_24',
                'spend_category_25', 'spend_category_26', 'spend_category_27',
                'spend_category_28', 'spend_category_29', 'spend_category_30',
                'spend_category_31', 'spend_category_32', 'spend_category_33',
                'spend_category_34', 'spend_category_35', 'spend_category_36',
                'spend_category_37', 'spend_category_38', 'spend_category_39',
                'spend_category_40', 'spend_category_41', 'spend_category_42',
                'spend_category_43', 'spend_category_44', 'spend_category_45',
                'spend_category_46', 'spend_category_47', 'spend_category_48',
                'spend_category_49', 'spend_category_50', 'spend_category_51',
                'spend_category_52', 'spend_category_53', 'spend_category_54',
                'spend_category_55', 'spend_category_56', 'spend_category_57',
                'spend_category_58', 'spend_category_59', 'spend_category_60',
                'marketing_brand_id', 'mkt_dist2airport'],
                dtype='object')
```

```
In [182]: categorical_cols = X_train.select_dtypes(exclude=['float', 'int']).columns
categorical_cols
```

```
Out[182]: Index(['trip_sta', 'mkt_cd', 'chan_type', 'person_id', 'dom_intl_in',
'city_nm', 'state_cd', 'ctry_cd', 'vend_cd', 'vend_brand',
'pwp_book_flag', 'prepay_in', 'net_tkt_ct', 'prog_id', 'card_type',
'cm_dma', 'card_ctgy', 'srce_nm', 'orig_state', 'orig_ctry',
'pymt_form', 'local_curr_cd', 'doc_sta', 'rgn_cd', 'acct_nm',
'card_ctgy_grp', 'htl_ctry_cd', 'pseudo_city_cd', 'agcy_nm',
'acct_type', 'cust_type', 'trvl_ctry_orig_rgn', 'trvl_ctry_dest_rgn',
'seg_lvl_strt_month', 'cross_sell_type_A', 'cross_sell_type_O',
'cross_sell_type_S', 'cross_sell_type_T', 'name', 'supp_id', 'brand_id',
'brand_name', 'marketing_brand_name', 'status', 'city_name',
'state_name', 'region_name', 'country_name', 'postal_code', 'website',
'teaser', 'description', 'insider_tip', 'where_staying',
'where_to_dine', 'where_to_relax', 'worth_experiencing', 'sabre_hod',
'cardmember_favorite', 'is_new', 'airport_name', 'airport_code',
'feature_PeFr', 'feature_Hi', 'feature_SpOnSi', 'feature_FaFr',
'feature_Ro', 'feature_GuAd', 'feature_CaOnSi', 'feature_FiCeOnSi',
'feature_PrSt', 'feature_Se', 'feature_GoCo', 'feature_SaEx',
'feature_Ar', 'feature_SkDe', 'feature_CuCl', 'feature_AlIn',
'feature_AdOn', 'feature_Tr', 'feature_PoOnSi', 'feature_EnCe',
'feature_BuFr', 'feature_Me', 'feature_Be', 'feature_PrVi',
'feature_ReanBa', 'feature_Bo', 'feature_CaMeFa'],
dtype='object')
```

```
In [183]: categorical_cols = categorical_cols.drop(['person_id'])
```

Model Definition

Now, lets fit the CatBoost model. The recommendation is to use 1000 iterations.

```
In [184]: model = CatBoostClassifier(cat_features=categorical_cols, iterations=1000)
```

```
In [185]: X_train.info(verbose=True, null_counts=True)
```

```

<class 'pandas.core.frame.DataFrame'>
Int64Index: 749028 entries, 125270 to 605129
Data columns (total 158 columns):
#      Column                                Non-Null Count  Dtype
---  -
0      trip_sta                                749028 non-null  object
1      mkt_cd                                  749028 non-null  object
2      chan_type                              749028 non-null  object
3      person_id                             749028 non-null  object
4      trip_day_ct                            749028 non-null  float64
5      dom_intl_in                            749028 non-null  object
6      city_nm                                749028 non-null  object
7      state_cd                              749028 non-null  object
8      ctry_cd                                749028 non-null  object
9      vend_cd                               749028 non-null  object
10     vend_brand                            749028 non-null  object
11     pwp_book_flag                         749028 non-null  object
12     prepay_in                             749028 non-null  object
13     rm_no                                 749028 non-null  int64
14     net_tkt_ct                            749028 non-null  object
15     prog_id                               749028 non-null  object
16     card_type                             749028 non-null  object
17     cm_dma                                749028 non-null  object
18     card_ctgy                             749028 non-null  object
19     srce_nm                               749028 non-null  object
20     orig_state                            749028 non-null  object
21     orig_ctry                             749028 non-null  object
22     pymt_form                             749028 non-null  object
23     local_curr_cd                         749028 non-null  object
24     doc_sta                               749028 non-null  object
25     rgn_cd                                749028 non-null  object
26     acct_nm                               749028 non-null  object
27     card_ctgy_grp                         749028 non-null  object
28     htl_ctry_cd                           749028 non-null  object
29     pseudo_city_cd                       749028 non-null  object
30     agcy_nm                               749028 non-null  object
31     acct_type                             749028 non-null  object
32     cust_type                             749028 non-null  object
33     htl_usd_rt                            749028 non-null  float64
34     trvl_ctry_orig_rgn                   749028 non-null  object
35     trvl_ctry_dest_rgn                   749028 non-null  object
36     pnr_creat_ts_month                    749028 non-null  int64
37     seg_lvl_strt_month                    749028 non-null  object

```

38	trip_advance_days	749028	non-null	float64
39	seg_lvl_end_month	749028	non-null	float64
40	cross_sell_type_A	749028	non-null	object
41	cross_sell_type_O	749028	non-null	object
42	cross_sell_type_S	749028	non-null	object
43	cross_sell_type_T	749028	non-null	object
44	cmpnt_creat_dt_month	749028	non-null	int64
45	spend_category_1	749028	non-null	float64
46	spend_category_2	749028	non-null	float64
47	spend_category_3	749028	non-null	float64
48	spend_category_4	749028	non-null	float64
49	spend_category_5	749028	non-null	float64
50	spend_category_6	749028	non-null	float64
51	spend_category_7	749028	non-null	float64
52	spend_category_8	749028	non-null	float64
53	spend_category_9	749028	non-null	float64
54	spend_category_10	749028	non-null	float64
55	spend_category_11	749028	non-null	float64
56	spend_category_12	749028	non-null	float64
57	spend_category_13	749028	non-null	float64
58	spend_category_14	749028	non-null	float64
59	spend_category_15	749028	non-null	float64
60	spend_category_16	749028	non-null	float64
61	spend_category_17	749028	non-null	float64
62	spend_category_18	749028	non-null	float64
63	spend_category_19	749028	non-null	float64
64	spend_category_20	749028	non-null	float64
65	spend_category_21	749028	non-null	float64
66	spend_category_22	749028	non-null	float64
67	spend_category_23	749028	non-null	float64
68	spend_category_24	749028	non-null	float64
69	spend_category_25	749028	non-null	float64
70	spend_category_26	749028	non-null	float64
71	spend_category_27	749028	non-null	float64
72	spend_category_28	749028	non-null	float64
73	spend_category_29	749028	non-null	float64
74	spend_category_30	749028	non-null	float64
75	spend_category_31	749028	non-null	float64
76	spend_category_32	749028	non-null	float64
77	spend_category_33	749028	non-null	float64
78	spend_category_34	749028	non-null	float64
79	spend_category_35	749028	non-null	float64
80	spend_category_36	749028	non-null	float64

81	spend_category_37	749028	non-null	float64
82	spend_category_38	749028	non-null	float64
83	spend_category_39	749028	non-null	float64
84	spend_category_40	749028	non-null	float64
85	spend_category_41	749028	non-null	float64
86	spend_category_42	749028	non-null	float64
87	spend_category_43	749028	non-null	float64
88	spend_category_44	749028	non-null	float64
89	spend_category_45	749028	non-null	float64
90	spend_category_46	749028	non-null	float64
91	spend_category_47	749028	non-null	float64
92	spend_category_48	749028	non-null	float64
93	spend_category_49	749028	non-null	float64
94	spend_category_50	749028	non-null	float64
95	spend_category_51	749028	non-null	float64
96	spend_category_52	749028	non-null	float64
97	spend_category_53	749028	non-null	float64
98	spend_category_54	749028	non-null	float64
99	spend_category_55	749028	non-null	float64
100	spend_category_56	749028	non-null	float64
101	spend_category_57	749028	non-null	float64
102	spend_category_58	749028	non-null	float64
103	spend_category_59	749028	non-null	float64
104	spend_category_60	749028	non-null	float64
105	name	749028	non-null	object
106	supp_id	749028	non-null	object
107	brand_id	749028	non-null	object
108	brand_name	749028	non-null	object
109	marketing_brand_id	749028	non-null	float64
110	marketing_brand_name	749028	non-null	object
111	status	749028	non-null	object
112	city_name	749028	non-null	object
113	state_name	749028	non-null	object
114	region_name	749028	non-null	object
115	country_name	749028	non-null	object
116	postal_code	749028	non-null	object
117	website	749028	non-null	object
118	teaser	749028	non-null	object
119	description	749028	non-null	object
120	insider_tip	749028	non-null	object
121	where_staying	749028	non-null	object
122	where_to_dine	749028	non-null	object
123	where_to_relax	749028	non-null	object

124	worth_experiencing	749028	non-null	object
125	sabre_hod	749028	non-null	object
126	cardmember_favorite	749028	non-null	object
127	is_new	749028	non-null	object
128	mkt_dist2airport	749028	non-null	float64
129	airport_name	749028	non-null	object
130	airport_code	749028	non-null	object
131	feature_PeFr	749028	non-null	object
132	feature_Hi	749028	non-null	object
133	feature_SpOnSi	749028	non-null	object
134	feature_FaFr	749028	non-null	object
135	feature_Ro	749028	non-null	object
136	feature_GuAd	749028	non-null	object
137	feature_CaOnSi	749028	non-null	object
138	feature_FiCeOnSi	749028	non-null	object
139	feature_PrSt	749028	non-null	object
140	feature_Se	749028	non-null	object
141	feature_GoCo	749028	non-null	object
142	feature_SaEx	749028	non-null	object
143	feature_Ar	749028	non-null	object
144	feature_SkDe	749028	non-null	object
145	feature_CuCl	749028	non-null	object
146	feature_AlIn	749028	non-null	object
147	feature_AdOn	749028	non-null	object
148	feature_Tr	749028	non-null	object
149	feature_PoOnSi	749028	non-null	object
150	feature_EnCe	749028	non-null	object
151	feature_BuFr	749028	non-null	object
152	feature_Me	749028	non-null	object
153	feature_Be	749028	non-null	object
154	feature_PrVi	749028	non-null	object
155	feature_ReanBa	749028	non-null	object
156	feature_Bo	749028	non-null	object
157	feature_CaMeFa	749028	non-null	object

dtypes: float64(66), int64(3), object(89)
memory usage: 908.6+ MB

```
In [186]: model.fit(X=X_train.drop(columns=[ 'person_id' ]), y=y_train)
```

Learning rate set to 0.173918

0:	learn: 0.6666618	total: 589ms	remaining: 9m 48s
1:	learn: 0.6467523	total: 1.17s	remaining: 9m 44s
2:	learn: 0.6325220	total: 1.84s	remaining: 10m 10s
3:	learn: 0.6158830	total: 2.52s	remaining: 10m 28s
4:	learn: 0.6036279	total: 3.35s	remaining: 11m 5s
5:	learn: 0.5955043	total: 4.59s	remaining: 12m 40s
6:	learn: 0.5887795	total: 5.22s	remaining: 12m 20s
7:	learn: 0.5844147	total: 6.04s	remaining: 12m 29s
8:	learn: 0.5787668	total: 7.19s	remaining: 13m 12s
9:	learn: 0.5735923	total: 8.38s	remaining: 13m 49s
10:	learn: 0.5698652	total: 9.83s	remaining: 14m 44s
11:	learn: 0.5668708	total: 10.9s	remaining: 14m 54s
12:	learn: 0.5610876	total: 12s	remaining: 15m 9s
13:	learn: 0.5583692	total: 12.8s	remaining: 15m 4s
14:	learn: 0.5532840	total: 14.8s	remaining: 16m 14s
15:	learn: 0.5497378	total: 16.8s	remaining: 17m 15s
16:	learn: 0.5476062	total: 18.1s	remaining: 17m 24s
17:	learn: 0.5449002	total: 18.7s	remaining: 17m 1s
18:	learn: 0.5415441	total: 21.1s	remaining: 18m 7s
19:	learn: 0.5399003	total: 22.3s	remaining: 18m 12s
20:	learn: 0.5372358	total: 24.9s	remaining: 19m 19s
21:	learn: 0.5349566	total: 25.9s	remaining: 19m 10s
22:	learn: 0.5327246	total: 27.8s	remaining: 19m 41s
23:	learn: 0.5304882	total: 28.8s	remaining: 19m 32s
24:	learn: 0.5269069	total: 31.6s	remaining: 20m 30s
25:	learn: 0.5255416	total: 33.1s	remaining: 20m 41s
26:	learn: 0.5245206	total: 34s	remaining: 20m 27s
27:	learn: 0.5235276	total: 34.7s	remaining: 20m 6s
28:	learn: 0.5224985	total: 35.4s	remaining: 19m 46s
29:	learn: 0.5173701	total: 38.5s	remaining: 20m 44s
30:	learn: 0.5164386	total: 40.2s	remaining: 20m 57s
31:	learn: 0.5147543	total: 43.1s	remaining: 21m 45s
32:	learn: 0.5134104	total: 45.1s	remaining: 22m 2s
33:	learn: 0.5128685	total: 45.9s	remaining: 21m 44s
34:	learn: 0.5101579	total: 49.3s	remaining: 22m 38s
35:	learn: 0.5094947	total: 50.1s	remaining: 22m 22s
36:	learn: 0.5082917	total: 50.9s	remaining: 22m 3s
37:	learn: 0.5076106	total: 51.4s	remaining: 21m 40s
38:	learn: 0.5068658	total: 52.4s	remaining: 21m 31s
39:	learn: 0.5061274	total: 56s	remaining: 22m 24s
40:	learn: 0.5049875	total: 56.8s	remaining: 22m 8s
41:	learn: 0.5038877	total: 57.6s	remaining: 21m 54s

42:	learn: 0.5030068	total: 58.7s	remaining: 21m 46s
43:	learn: 0.5022789	total: 59.4s	remaining: 21m 30s
44:	learn: 0.5012893	total: 1m	remaining: 21m 15s
45:	learn: 0.5006387	total: 1m 1s	remaining: 21m 13s
46:	learn: 0.4976008	total: 1m 4s	remaining: 21m 51s
47:	learn: 0.4964076	total: 1m 5s	remaining: 21m 42s
48:	learn: 0.4959508	total: 1m 6s	remaining: 21m 32s
49:	learn: 0.4947960	total: 1m 10s	remaining: 22m 11s
50:	learn: 0.4942153	total: 1m 10s	remaining: 21m 58s
51:	learn: 0.4932416	total: 1m 12s	remaining: 22m 3s
52:	learn: 0.4923819	total: 1m 15s	remaining: 22m 31s
53:	learn: 0.4916433	total: 1m 16s	remaining: 22m 25s
54:	learn: 0.4895406	total: 1m 19s	remaining: 22m 49s
55:	learn: 0.4890787	total: 1m 20s	remaining: 22m 40s
56:	learn: 0.4884788	total: 1m 21s	remaining: 22m 31s
57:	learn: 0.4881665	total: 1m 22s	remaining: 22m 18s
58:	learn: 0.4875945	total: 1m 23s	remaining: 22m 5s
59:	learn: 0.4871809	total: 1m 24s	remaining: 21m 59s
60:	learn: 0.4866713	total: 1m 25s	remaining: 21m 54s
61:	learn: 0.4863536	total: 1m 26s	remaining: 21m 47s
62:	learn: 0.4857206	total: 1m 27s	remaining: 21m 34s
63:	learn: 0.4855159	total: 1m 27s	remaining: 21m 24s
64:	learn: 0.4850007	total: 1m 28s	remaining: 21m 17s
65:	learn: 0.4847706	total: 1m 29s	remaining: 21m 10s
66:	learn: 0.4837550	total: 1m 31s	remaining: 21m 19s
67:	learn: 0.4829935	total: 1m 33s	remaining: 21m 18s
68:	learn: 0.4824169	total: 1m 34s	remaining: 21m 11s
69:	learn: 0.4823234	total: 1m 35s	remaining: 21m 2s
70:	learn: 0.4818059	total: 1m 38s	remaining: 21m 28s
71:	learn: 0.4814537	total: 1m 39s	remaining: 21m 18s
72:	learn: 0.4811781	total: 1m 40s	remaining: 21m 18s
73:	learn: 0.4807297	total: 1m 41s	remaining: 21m 7s
74:	learn: 0.4802857	total: 1m 43s	remaining: 21m 13s
75:	learn: 0.4800626	total: 1m 44s	remaining: 21m 13s
76:	learn: 0.4796739	total: 1m 45s	remaining: 21m 2s
77:	learn: 0.4793719	total: 1m 46s	remaining: 20m 53s
78:	learn: 0.4788920	total: 1m 47s	remaining: 20m 49s
79:	learn: 0.4784045	total: 1m 47s	remaining: 20m 41s
80:	learn: 0.4780330	total: 1m 48s	remaining: 20m 36s
81:	learn: 0.4774384	total: 1m 52s	remaining: 21m 1s
82:	learn: 0.4768113	total: 1m 55s	remaining: 21m 17s
83:	learn: 0.4758691	total: 1m 58s	remaining: 21m 31s
84:	learn: 0.4755082	total: 1m 59s	remaining: 21m 24s

85:	learn: 0.4751231	total: 2m	remaining: 21m 18s
86:	learn: 0.4745333	total: 2m 1s	remaining: 21m 9s
87:	learn: 0.4742721	total: 2m 1s	remaining: 21m 1s
88:	learn: 0.4738333	total: 2m 2s	remaining: 20m 53s
89:	learn: 0.4734413	total: 2m 3s	remaining: 20m 44s
90:	learn: 0.4730350	total: 2m 3s	remaining: 20m 34s
91:	learn: 0.4726894	total: 2m 4s	remaining: 20m 26s
92:	learn: 0.4724116	total: 2m 5s	remaining: 20m 19s
93:	learn: 0.4720357	total: 2m 5s	remaining: 20m 12s
94:	learn: 0.4717680	total: 2m 6s	remaining: 20m 5s
95:	learn: 0.4714495	total: 2m 7s	remaining: 19m 58s
96:	learn: 0.4708015	total: 2m 10s	remaining: 20m 10s
97:	learn: 0.4704985	total: 2m 10s	remaining: 20m 4s
98:	learn: 0.4699898	total: 2m 13s	remaining: 20m 17s
99:	learn: 0.4697706	total: 2m 14s	remaining: 20m 11s
100:	learn: 0.4695587	total: 2m 15s	remaining: 20m 5s
101:	learn: 0.4692531	total: 2m 16s	remaining: 19m 59s
102:	learn: 0.4690369	total: 2m 17s	remaining: 19m 59s
103:	learn: 0.4687543	total: 2m 18s	remaining: 19m 51s
104:	learn: 0.4683388	total: 2m 19s	remaining: 19m 47s
105:	learn: 0.4679560	total: 2m 20s	remaining: 19m 40s
106:	learn: 0.4677010	total: 2m 20s	remaining: 19m 34s
107:	learn: 0.4673802	total: 2m 23s	remaining: 19m 45s
108:	learn: 0.4671912	total: 2m 25s	remaining: 19m 47s
109:	learn: 0.4670854	total: 2m 26s	remaining: 19m 43s
110:	learn: 0.4668083	total: 2m 27s	remaining: 19m 38s
111:	learn: 0.4661226	total: 2m 29s	remaining: 19m 44s
112:	learn: 0.4658515	total: 2m 30s	remaining: 19m 40s
113:	learn: 0.4656459	total: 2m 31s	remaining: 19m 36s
114:	learn: 0.4654498	total: 2m 32s	remaining: 19m 32s
115:	learn: 0.4652339	total: 2m 33s	remaining: 19m 31s
116:	learn: 0.4649963	total: 2m 34s	remaining: 19m 28s
117:	learn: 0.4647126	total: 2m 35s	remaining: 19m 22s
118:	learn: 0.4642389	total: 2m 37s	remaining: 19m 27s
119:	learn: 0.4639267	total: 2m 38s	remaining: 19m 21s
120:	learn: 0.4637130	total: 2m 38s	remaining: 19m 15s
121:	learn: 0.4635259	total: 2m 39s	remaining: 19m 10s
122:	learn: 0.4633397	total: 2m 40s	remaining: 19m 7s
123:	learn: 0.4631250	total: 2m 43s	remaining: 19m 13s
124:	learn: 0.4630059	total: 2m 44s	remaining: 19m 8s
125:	learn: 0.4628661	total: 2m 45s	remaining: 19m 4s
126:	learn: 0.4626568	total: 2m 45s	remaining: 18m 58s
127:	learn: 0.4624256	total: 2m 47s	remaining: 19m 3s

128:	learn: 0.4619152	total: 2m 49s	remaining: 19m 2s
129:	learn: 0.4617256	total: 2m 49s	remaining: 18m 57s
130:	learn: 0.4615168	total: 2m 51s	remaining: 18m 57s
131:	learn: 0.4613130	total: 2m 52s	remaining: 18m 55s
132:	learn: 0.4611531	total: 2m 53s	remaining: 18m 49s
133:	learn: 0.4609408	total: 2m 54s	remaining: 18m 45s
134:	learn: 0.4606831	total: 2m 55s	remaining: 18m 47s
135:	learn: 0.4604878	total: 2m 57s	remaining: 18m 46s
136:	learn: 0.4604073	total: 2m 58s	remaining: 18m 42s
137:	learn: 0.4602226	total: 2m 58s	remaining: 18m 37s
138:	learn: 0.4600831	total: 2m 59s	remaining: 18m 34s
139:	learn: 0.4597338	total: 3m 4s	remaining: 18m 51s
140:	learn: 0.4595301	total: 3m 5s	remaining: 18m 49s
141:	learn: 0.4593297	total: 3m 6s	remaining: 18m 44s
142:	learn: 0.4591894	total: 3m 7s	remaining: 18m 42s
143:	learn: 0.4585071	total: 3m 9s	remaining: 18m 48s
144:	learn: 0.4583565	total: 3m 10s	remaining: 18m 45s
145:	learn: 0.4581914	total: 3m 11s	remaining: 18m 41s
146:	learn: 0.4580081	total: 3m 12s	remaining: 18m 37s
147:	learn: 0.4577775	total: 3m 13s	remaining: 18m 31s
148:	learn: 0.4572307	total: 3m 16s	remaining: 18m 41s
149:	learn: 0.4569648	total: 3m 17s	remaining: 18m 38s
150:	learn: 0.4568529	total: 3m 18s	remaining: 18m 34s
151:	learn: 0.4567522	total: 3m 19s	remaining: 18m 31s
152:	learn: 0.4565983	total: 3m 19s	remaining: 18m 26s
153:	learn: 0.4564929	total: 3m 20s	remaining: 18m 21s
154:	learn: 0.4563967	total: 3m 21s	remaining: 18m 18s
155:	learn: 0.4562504	total: 3m 23s	remaining: 18m 20s
156:	learn: 0.4560093	total: 3m 24s	remaining: 18m 16s
157:	learn: 0.4558902	total: 3m 24s	remaining: 18m 11s
158:	learn: 0.4557261	total: 3m 25s	remaining: 18m 8s
159:	learn: 0.4555413	total: 3m 26s	remaining: 18m 4s
160:	learn: 0.4554213	total: 3m 27s	remaining: 18m
161:	learn: 0.4552382	total: 3m 28s	remaining: 17m 58s
162:	learn: 0.4550617	total: 3m 29s	remaining: 17m 55s
163:	learn: 0.4549202	total: 3m 30s	remaining: 17m 51s
164:	learn: 0.4546007	total: 3m 31s	remaining: 17m 52s
165:	learn: 0.4544623	total: 3m 32s	remaining: 17m 49s
166:	learn: 0.4542772	total: 3m 33s	remaining: 17m 46s
167:	learn: 0.4541392	total: 3m 34s	remaining: 17m 42s
168:	learn: 0.4539372	total: 3m 35s	remaining: 17m 38s
169:	learn: 0.4538636	total: 3m 35s	remaining: 17m 33s
170:	learn: 0.4537520	total: 3m 37s	remaining: 17m 35s

171:	learn: 0.4534925	total: 3m 38s	remaining: 17m 32s
172:	learn: 0.4533545	total: 3m 39s	remaining: 17m 29s
173:	learn: 0.4532327	total: 3m 40s	remaining: 17m 27s
174:	learn: 0.4531555	total: 3m 41s	remaining: 17m 23s
175:	learn: 0.4530859	total: 3m 42s	remaining: 17m 22s
176:	learn: 0.4529249	total: 3m 43s	remaining: 17m 18s
177:	learn: 0.4528173	total: 3m 44s	remaining: 17m 16s
178:	learn: 0.4526862	total: 3m 45s	remaining: 17m 12s
179:	learn: 0.4526093	total: 3m 45s	remaining: 17m 8s
180:	learn: 0.4523705	total: 3m 47s	remaining: 17m 10s
181:	learn: 0.4522592	total: 3m 48s	remaining: 17m 7s
182:	learn: 0.4520788	total: 3m 49s	remaining: 17m 4s
183:	learn: 0.4519704	total: 3m 50s	remaining: 17m 1s
184:	learn: 0.4517735	total: 3m 53s	remaining: 17m 10s
185:	learn: 0.4516117	total: 3m 55s	remaining: 17m 8s
186:	learn: 0.4514984	total: 3m 55s	remaining: 17m 5s
187:	learn: 0.4513790	total: 3m 56s	remaining: 17m
188:	learn: 0.4512524	total: 3m 57s	remaining: 16m 57s
189:	learn: 0.4511254	total: 3m 58s	remaining: 16m 54s
190:	learn: 0.4510065	total: 3m 58s	remaining: 16m 51s
191:	learn: 0.4507971	total: 3m 59s	remaining: 16m 47s
192:	learn: 0.4505496	total: 4m 1s	remaining: 16m 49s
193:	learn: 0.4504500	total: 4m 2s	remaining: 16m 48s
194:	learn: 0.4502621	total: 4m 3s	remaining: 16m 47s
195:	learn: 0.4500899	total: 4m 4s	remaining: 16m 43s
196:	learn: 0.4499881	total: 4m 5s	remaining: 16m 40s
197:	learn: 0.4499488	total: 4m 7s	remaining: 16m 41s
198:	learn: 0.4498566	total: 4m 7s	remaining: 16m 37s
199:	learn: 0.4493939	total: 4m 9s	remaining: 16m 36s
200:	learn: 0.4490068	total: 4m 11s	remaining: 16m 39s
201:	learn: 0.4489015	total: 4m 11s	remaining: 16m 35s
202:	learn: 0.4485980	total: 4m 13s	remaining: 16m 36s
203:	learn: 0.4485178	total: 4m 14s	remaining: 16m 34s
204:	learn: 0.4484246	total: 4m 15s	remaining: 16m 30s
205:	learn: 0.4483398	total: 4m 16s	remaining: 16m 28s
206:	learn: 0.4482186	total: 4m 16s	remaining: 16m 24s
207:	learn: 0.4476649	total: 4m 18s	remaining: 16m 25s
208:	learn: 0.4475330	total: 4m 20s	remaining: 16m 24s
209:	learn: 0.4470394	total: 4m 22s	remaining: 16m 26s
210:	learn: 0.4469424	total: 4m 22s	remaining: 16m 22s
211:	learn: 0.4467775	total: 4m 24s	remaining: 16m 24s
212:	learn: 0.4466671	total: 4m 25s	remaining: 16m 22s
213:	learn: 0.4465629	total: 4m 26s	remaining: 16m 20s

214:	learn: 0.4464677	total: 4m 27s	remaining: 16m 16s
215:	learn: 0.4463291	total: 4m 28s	remaining: 16m 12s
216:	learn: 0.4459945	total: 4m 29s	remaining: 16m 11s
217:	learn: 0.4459258	total: 4m 29s	remaining: 16m 7s
218:	learn: 0.4457667	total: 4m 30s	remaining: 16m 6s
219:	learn: 0.4455509	total: 4m 32s	remaining: 16m 5s
220:	learn: 0.4454478	total: 4m 33s	remaining: 16m 2s
221:	learn: 0.4453701	total: 4m 33s	remaining: 15m 59s
222:	learn: 0.4452619	total: 4m 34s	remaining: 15m 56s
223:	learn: 0.4450783	total: 4m 35s	remaining: 15m 54s
224:	learn: 0.4449859	total: 4m 37s	remaining: 15m 54s
225:	learn: 0.4446553	total: 4m 38s	remaining: 15m 52s
226:	learn: 0.4442039	total: 4m 39s	remaining: 15m 51s
227:	learn: 0.4440293	total: 4m 40s	remaining: 15m 49s
228:	learn: 0.4439191	total: 4m 41s	remaining: 15m 47s
229:	learn: 0.4438254	total: 4m 42s	remaining: 15m 45s
230:	learn: 0.4437430	total: 4m 43s	remaining: 15m 43s
231:	learn: 0.4436595	total: 4m 44s	remaining: 15m 40s
232:	learn: 0.4434588	total: 4m 46s	remaining: 15m 43s
233:	learn: 0.4433612	total: 4m 48s	remaining: 15m 43s
234:	learn: 0.4433035	total: 4m 49s	remaining: 15m 40s
235:	learn: 0.4431954	total: 4m 49s	remaining: 15m 37s
236:	learn: 0.4428057	total: 4m 51s	remaining: 15m 37s
237:	learn: 0.4426863	total: 4m 51s	remaining: 15m 34s
238:	learn: 0.4425954	total: 4m 53s	remaining: 15m 34s
239:	learn: 0.4425213	total: 4m 54s	remaining: 15m 32s
240:	learn: 0.4424420	total: 4m 55s	remaining: 15m 30s
241:	learn: 0.4423802	total: 4m 56s	remaining: 15m 28s
242:	learn: 0.4422991	total: 4m 57s	remaining: 15m 25s
243:	learn: 0.4421959	total: 4m 58s	remaining: 15m 23s
244:	learn: 0.4421232	total: 4m 58s	remaining: 15m 21s
245:	learn: 0.4419745	total: 5m	remaining: 15m 20s
246:	learn: 0.4419117	total: 5m	remaining: 15m 17s
247:	learn: 0.4418454	total: 5m 1s	remaining: 15m 15s
248:	learn: 0.4417306	total: 5m 2s	remaining: 15m 12s
249:	learn: 0.4416751	total: 5m 3s	remaining: 15m 11s
250:	learn: 0.4416137	total: 5m 5s	remaining: 15m 10s
251:	learn: 0.4415072	total: 5m 5s	remaining: 15m 7s
252:	learn: 0.4414215	total: 5m 6s	remaining: 15m 5s
253:	learn: 0.4412846	total: 5m 8s	remaining: 15m 5s
254:	learn: 0.4410813	total: 5m 10s	remaining: 15m 5s
255:	learn: 0.4409768	total: 5m 10s	remaining: 15m 3s
256:	learn: 0.4409150	total: 5m 12s	remaining: 15m 3s

257:	learn: 0.4407967	total: 5m 13s	remaining: 15m
258:	learn: 0.4406861	total: 5m 14s	remaining: 14m 59s
259:	learn: 0.4405995	total: 5m 14s	remaining: 14m 56s
260:	learn: 0.4405736	total: 5m 15s	remaining: 14m 53s
261:	learn: 0.4404533	total: 5m 16s	remaining: 14m 50s
262:	learn: 0.4403711	total: 5m 16s	remaining: 14m 47s
263:	learn: 0.4400484	total: 5m 19s	remaining: 14m 51s
264:	learn: 0.4399702	total: 5m 20s	remaining: 14m 49s
265:	learn: 0.4397964	total: 5m 24s	remaining: 14m 54s
266:	learn: 0.4397334	total: 5m 25s	remaining: 14m 52s
267:	learn: 0.4395883	total: 5m 25s	remaining: 14m 49s
268:	learn: 0.4395156	total: 5m 26s	remaining: 14m 47s
269:	learn: 0.4394594	total: 5m 27s	remaining: 14m 45s
270:	learn: 0.4393585	total: 5m 29s	remaining: 14m 45s
271:	learn: 0.4392658	total: 5m 29s	remaining: 14m 43s
272:	learn: 0.4391833	total: 5m 30s	remaining: 14m 40s
273:	learn: 0.4389691	total: 5m 32s	remaining: 14m 40s
274:	learn: 0.4389128	total: 5m 33s	remaining: 14m 39s
275:	learn: 0.4388350	total: 5m 34s	remaining: 14m 37s
276:	learn: 0.4387664	total: 5m 35s	remaining: 14m 35s
277:	learn: 0.4386986	total: 5m 36s	remaining: 14m 33s
278:	learn: 0.4385822	total: 5m 38s	remaining: 14m 33s
279:	learn: 0.4383189	total: 5m 39s	remaining: 14m 33s
280:	learn: 0.4382901	total: 5m 40s	remaining: 14m 31s
281:	learn: 0.4380668	total: 5m 44s	remaining: 14m 37s
282:	learn: 0.4379555	total: 5m 47s	remaining: 14m 40s
283:	learn: 0.4379018	total: 5m 49s	remaining: 14m 41s
284:	learn: 0.4378060	total: 5m 51s	remaining: 14m 40s
285:	learn: 0.4376390	total: 5m 53s	remaining: 14m 43s
286:	learn: 0.4375682	total: 5m 54s	remaining: 14m 41s
287:	learn: 0.4374411	total: 5m 55s	remaining: 14m 38s
288:	learn: 0.4374109	total: 5m 56s	remaining: 14m 37s
289:	learn: 0.4373235	total: 5m 57s	remaining: 14m 35s
290:	learn: 0.4372995	total: 5m 58s	remaining: 14m 33s
291:	learn: 0.4372210	total: 5m 59s	remaining: 14m 31s
292:	learn: 0.4371755	total: 5m 59s	remaining: 14m 28s
293:	learn: 0.4370580	total: 6m	remaining: 14m 26s
294:	learn: 0.4370095	total: 6m 1s	remaining: 14m 24s
295:	learn: 0.4369617	total: 6m 3s	remaining: 14m 23s
296:	learn: 0.4368541	total: 6m 4s	remaining: 14m 22s
297:	learn: 0.4368161	total: 6m 4s	remaining: 14m 19s
298:	learn: 0.4367655	total: 6m 5s	remaining: 14m 17s
299:	learn: 0.4367274	total: 6m 6s	remaining: 14m 15s

300:	learn: 0.4365932	total: 6m 7s	remaining: 14m 13s
301:	learn: 0.4365300	total: 6m 9s	remaining: 14m 14s
302:	learn: 0.4364313	total: 6m 12s	remaining: 14m 17s
303:	learn: 0.4362764	total: 6m 13s	remaining: 14m 15s
304:	learn: 0.4362061	total: 6m 14s	remaining: 14m 13s
305:	learn: 0.4361416	total: 6m 15s	remaining: 14m 12s
306:	learn: 0.4360312	total: 6m 16s	remaining: 14m 10s
307:	learn: 0.4359371	total: 6m 17s	remaining: 14m 7s
308:	learn: 0.4358781	total: 6m 18s	remaining: 14m 7s
309:	learn: 0.4358214	total: 6m 20s	remaining: 14m 7s
310:	learn: 0.4358031	total: 6m 21s	remaining: 14m 5s
311:	learn: 0.4356464	total: 6m 22s	remaining: 14m 3s
312:	learn: 0.4353851	total: 6m 24s	remaining: 14m 3s
313:	learn: 0.4352515	total: 6m 25s	remaining: 14m 2s
314:	learn: 0.4351822	total: 6m 27s	remaining: 14m 1s
315:	learn: 0.4351189	total: 6m 28s	remaining: 14m
316:	learn: 0.4350184	total: 6m 30s	remaining: 14m 2s
317:	learn: 0.4349308	total: 6m 33s	remaining: 14m 3s
318:	learn: 0.4348758	total: 6m 34s	remaining: 14m 2s
319:	learn: 0.4347806	total: 6m 37s	remaining: 14m 4s
320:	learn: 0.4347161	total: 6m 39s	remaining: 14m 5s
321:	learn: 0.4346549	total: 6m 40s	remaining: 14m 3s
322:	learn: 0.4345177	total: 6m 42s	remaining: 14m 3s
323:	learn: 0.4345044	total: 6m 43s	remaining: 14m 1s
324:	learn: 0.4344523	total: 6m 44s	remaining: 13m 59s
325:	learn: 0.4342917	total: 6m 46s	remaining: 14m
326:	learn: 0.4341222	total: 6m 47s	remaining: 13m 58s
327:	learn: 0.4340832	total: 6m 48s	remaining: 13m 57s
328:	learn: 0.4340441	total: 6m 49s	remaining: 13m 54s
329:	learn: 0.4339762	total: 6m 49s	remaining: 13m 52s
330:	learn: 0.4339472	total: 6m 50s	remaining: 13m 50s
331:	learn: 0.4338540	total: 6m 51s	remaining: 13m 47s
332:	learn: 0.4337835	total: 6m 52s	remaining: 13m 45s
333:	learn: 0.4337335	total: 6m 52s	remaining: 13m 43s
334:	learn: 0.4336914	total: 6m 53s	remaining: 13m 41s
335:	learn: 0.4336255	total: 6m 54s	remaining: 13m 39s
336:	learn: 0.4335418	total: 6m 55s	remaining: 13m 38s
337:	learn: 0.4335078	total: 6m 57s	remaining: 13m 37s
338:	learn: 0.4333836	total: 6m 58s	remaining: 13m 35s
339:	learn: 0.4333097	total: 6m 58s	remaining: 13m 33s
340:	learn: 0.4332819	total: 6m 59s	remaining: 13m 30s
341:	learn: 0.4332521	total: 7m	remaining: 13m 28s
342:	learn: 0.4332109	total: 7m	remaining: 13m 26s

343:	learn: 0.4331045	total: 7m 1s	remaining: 13m 24s
344:	learn: 0.4330705	total: 7m 2s	remaining: 13m 21s
345:	learn: 0.4330359	total: 7m 3s	remaining: 13m 19s
346:	learn: 0.4329441	total: 7m 6s	remaining: 13m 21s
347:	learn: 0.4327035	total: 7m 7s	remaining: 13m 20s
348:	learn: 0.4324892	total: 7m 9s	remaining: 13m 21s
349:	learn: 0.4324207	total: 7m 10s	remaining: 13m 19s
350:	learn: 0.4322875	total: 7m 11s	remaining: 13m 18s
351:	learn: 0.4322406	total: 7m 12s	remaining: 13m 16s
352:	learn: 0.4322069	total: 7m 13s	remaining: 13m 15s
353:	learn: 0.4321559	total: 7m 14s	remaining: 13m 13s
354:	learn: 0.4320735	total: 7m 15s	remaining: 13m 11s
355:	learn: 0.4320624	total: 7m 16s	remaining: 13m 9s
356:	learn: 0.4319551	total: 7m 17s	remaining: 13m 7s
357:	learn: 0.4318774	total: 7m 18s	remaining: 13m 5s
358:	learn: 0.4318167	total: 7m 18s	remaining: 13m 3s
359:	learn: 0.4317915	total: 7m 20s	remaining: 13m 2s
360:	learn: 0.4317154	total: 7m 21s	remaining: 13m 1s
361:	learn: 0.4316783	total: 7m 22s	remaining: 12m 59s
362:	learn: 0.4316155	total: 7m 22s	remaining: 12m 57s
363:	learn: 0.4315783	total: 7m 24s	remaining: 12m 57s
364:	learn: 0.4314900	total: 7m 25s	remaining: 12m 54s
365:	learn: 0.4314390	total: 7m 26s	remaining: 12m 53s
366:	learn: 0.4313542	total: 7m 27s	remaining: 12m 51s
367:	learn: 0.4313186	total: 7m 28s	remaining: 12m 49s
368:	learn: 0.4312056	total: 7m 28s	remaining: 12m 47s
369:	learn: 0.4311678	total: 7m 29s	remaining: 12m 45s
370:	learn: 0.4311399	total: 7m 30s	remaining: 12m 43s
371:	learn: 0.4311219	total: 7m 31s	remaining: 12m 41s
372:	learn: 0.4310379	total: 7m 31s	remaining: 12m 39s
373:	learn: 0.4310085	total: 7m 32s	remaining: 12m 36s
374:	learn: 0.4306500	total: 7m 34s	remaining: 12m 37s
375:	learn: 0.4305967	total: 7m 34s	remaining: 12m 35s
376:	learn: 0.4305003	total: 7m 38s	remaining: 12m 37s
377:	learn: 0.4304801	total: 7m 39s	remaining: 12m 35s
378:	learn: 0.4304489	total: 7m 40s	remaining: 12m 34s
379:	learn: 0.4302126	total: 7m 42s	remaining: 12m 34s
380:	learn: 0.4301536	total: 7m 43s	remaining: 12m 33s
381:	learn: 0.4300248	total: 7m 44s	remaining: 12m 31s
382:	learn: 0.4299575	total: 7m 45s	remaining: 12m 29s
383:	learn: 0.4298962	total: 7m 46s	remaining: 12m 27s
384:	learn: 0.4298680	total: 7m 46s	remaining: 12m 25s
385:	learn: 0.4298428	total: 7m 47s	remaining: 12m 24s

386:	learn: 0.4298063	total: 7m 48s	remaining: 12m 22s
387:	learn: 0.4297830	total: 7m 49s	remaining: 12m 20s
388:	learn: 0.4297504	total: 7m 50s	remaining: 12m 18s
389:	learn: 0.4296887	total: 7m 50s	remaining: 12m 16s
390:	learn: 0.4295425	total: 7m 53s	remaining: 12m 16s
391:	learn: 0.4294285	total: 7m 54s	remaining: 12m 15s
392:	learn: 0.4293982	total: 7m 55s	remaining: 12m 14s
393:	learn: 0.4293352	total: 7m 56s	remaining: 12m 12s
394:	learn: 0.4293133	total: 7m 56s	remaining: 12m 10s
395:	learn: 0.4290707	total: 7m 58s	remaining: 12m 10s
396:	learn: 0.4289634	total: 7m 59s	remaining: 12m 8s
397:	learn: 0.4287725	total: 8m 2s	remaining: 12m 10s
398:	learn: 0.4287069	total: 8m 5s	remaining: 12m 10s
399:	learn: 0.4286058	total: 8m 6s	remaining: 12m 9s
400:	learn: 0.4285241	total: 8m 7s	remaining: 12m 8s
401:	learn: 0.4282497	total: 8m 9s	remaining: 12m 8s
402:	learn: 0.4281682	total: 8m 11s	remaining: 12m 7s
403:	learn: 0.4281382	total: 8m 12s	remaining: 12m 6s
404:	learn: 0.4278706	total: 8m 15s	remaining: 12m 7s
405:	learn: 0.4277515	total: 8m 16s	remaining: 12m 6s
406:	learn: 0.4276924	total: 8m 18s	remaining: 12m 5s
407:	learn: 0.4276045	total: 8m 18s	remaining: 12m 3s
408:	learn: 0.4275049	total: 8m 22s	remaining: 12m 5s
409:	learn: 0.4274554	total: 8m 23s	remaining: 12m 4s
410:	learn: 0.4273156	total: 8m 24s	remaining: 12m 3s
411:	learn: 0.4272284	total: 8m 25s	remaining: 12m 1s
412:	learn: 0.4271184	total: 8m 27s	remaining: 12m
413:	learn: 0.4269414	total: 8m 28s	remaining: 11m 59s
414:	learn: 0.4268876	total: 8m 31s	remaining: 12m
415:	learn: 0.4268488	total: 8m 32s	remaining: 11m 59s
416:	learn: 0.4268313	total: 8m 33s	remaining: 11m 57s
417:	learn: 0.4267358	total: 8m 33s	remaining: 11m 55s
418:	learn: 0.4266244	total: 8m 35s	remaining: 11m 54s
419:	learn: 0.4264998	total: 8m 36s	remaining: 11m 53s
420:	learn: 0.4264566	total: 8m 37s	remaining: 11m 51s
421:	learn: 0.4263789	total: 8m 38s	remaining: 11m 49s
422:	learn: 0.4263430	total: 8m 39s	remaining: 11m 48s
423:	learn: 0.4261832	total: 8m 41s	remaining: 11m 48s
424:	learn: 0.4261711	total: 8m 42s	remaining: 11m 46s
425:	learn: 0.4260847	total: 8m 44s	remaining: 11m 46s
426:	learn: 0.4260280	total: 8m 45s	remaining: 11m 44s
427:	learn: 0.4260109	total: 8m 46s	remaining: 11m 43s
428:	learn: 0.4259213	total: 8m 47s	remaining: 11m 41s

429:	learn: 0.4258789	total: 8m 49s	remaining: 11m 41s
430:	learn: 0.4258103	total: 8m 51s	remaining: 11m 41s
431:	learn: 0.4257023	total: 8m 52s	remaining: 11m 40s
432:	learn: 0.4256749	total: 8m 53s	remaining: 11m 38s
433:	learn: 0.4256088	total: 8m 54s	remaining: 11m 36s
434:	learn: 0.4255654	total: 8m 55s	remaining: 11m 35s
435:	learn: 0.4255289	total: 8m 55s	remaining: 11m 33s
436:	learn: 0.4255061	total: 8m 56s	remaining: 11m 31s
437:	learn: 0.4254797	total: 8m 57s	remaining: 11m 29s
438:	learn: 0.4254185	total: 8m 58s	remaining: 11m 28s
439:	learn: 0.4253938	total: 9m	remaining: 11m 27s
440:	learn: 0.4253818	total: 9m	remaining: 11m 25s
441:	learn: 0.4253289	total: 9m 2s	remaining: 11m 24s
442:	learn: 0.4252939	total: 9m 4s	remaining: 11m 24s
443:	learn: 0.4252714	total: 9m 4s	remaining: 11m 22s
444:	learn: 0.4252133	total: 9m 5s	remaining: 11m 20s
445:	learn: 0.4251980	total: 9m 6s	remaining: 11m 18s
446:	learn: 0.4251873	total: 9m 7s	remaining: 11m 16s
447:	learn: 0.4251592	total: 9m 7s	remaining: 11m 14s
448:	learn: 0.4251252	total: 9m 8s	remaining: 11m 13s
449:	learn: 0.4250431	total: 9m 9s	remaining: 11m 11s
450:	learn: 0.4250263	total: 9m 10s	remaining: 11m 9s
451:	learn: 0.4248929	total: 9m 14s	remaining: 11m 12s
452:	learn: 0.4248330	total: 9m 16s	remaining: 11m 12s
453:	learn: 0.4247676	total: 9m 18s	remaining: 11m 11s
454:	learn: 0.4246796	total: 9m 18s	remaining: 11m 9s
455:	learn: 0.4246120	total: 9m 19s	remaining: 11m 7s
456:	learn: 0.4245306	total: 9m 20s	remaining: 11m 6s
457:	learn: 0.4245023	total: 9m 21s	remaining: 11m 4s
458:	learn: 0.4244871	total: 9m 22s	remaining: 11m 2s
459:	learn: 0.4244125	total: 9m 23s	remaining: 11m 1s
460:	learn: 0.4243794	total: 9m 24s	remaining: 11m
461:	learn: 0.4243297	total: 9m 25s	remaining: 10m 58s
462:	learn: 0.4242885	total: 9m 26s	remaining: 10m 56s
463:	learn: 0.4242687	total: 9m 26s	remaining: 10m 54s
464:	learn: 0.4241938	total: 9m 27s	remaining: 10m 52s
465:	learn: 0.4241654	total: 9m 28s	remaining: 10m 51s
466:	learn: 0.4241507	total: 9m 28s	remaining: 10m 49s
467:	learn: 0.4240042	total: 9m 30s	remaining: 10m 48s
468:	learn: 0.4239846	total: 9m 31s	remaining: 10m 47s
469:	learn: 0.4239023	total: 9m 33s	remaining: 10m 46s
470:	learn: 0.4238857	total: 9m 33s	remaining: 10m 44s
471:	learn: 0.4238000	total: 9m 34s	remaining: 10m 42s

472:	learn: 0.4237526	total: 9m 35s	remaining: 10m 41s
473:	learn: 0.4237097	total: 9m 36s	remaining: 10m 39s
474:	learn: 0.4236696	total: 9m 37s	remaining: 10m 38s
475:	learn: 0.4236426	total: 9m 38s	remaining: 10m 37s
476:	learn: 0.4235836	total: 9m 39s	remaining: 10m 35s
477:	learn: 0.4235576	total: 9m 40s	remaining: 10m 34s
478:	learn: 0.4234941	total: 9m 41s	remaining: 10m 32s
479:	learn: 0.4233528	total: 9m 42s	remaining: 10m 31s
480:	learn: 0.4233117	total: 9m 43s	remaining: 10m 29s
481:	learn: 0.4232480	total: 9m 46s	remaining: 10m 29s
482:	learn: 0.4232184	total: 9m 46s	remaining: 10m 28s
483:	learn: 0.4230792	total: 9m 50s	remaining: 10m 29s
484:	learn: 0.4230410	total: 9m 50s	remaining: 10m 27s
485:	learn: 0.4229051	total: 9m 53s	remaining: 10m 28s
486:	learn: 0.4228644	total: 9m 55s	remaining: 10m 27s
487:	learn: 0.4227369	total: 9m 58s	remaining: 10m 27s
488:	learn: 0.4226878	total: 9m 59s	remaining: 10m 26s
489:	learn: 0.4226575	total: 9m 59s	remaining: 10m 24s
490:	learn: 0.4225520	total: 10m 4s	remaining: 10m 26s
491:	learn: 0.4224764	total: 10m 4s	remaining: 10m 24s
492:	learn: 0.4224129	total: 10m 5s	remaining: 10m 22s
493:	learn: 0.4223486	total: 10m 6s	remaining: 10m 21s
494:	learn: 0.4221789	total: 10m 8s	remaining: 10m 20s
495:	learn: 0.4220768	total: 10m 13s	remaining: 10m 23s
496:	learn: 0.4220363	total: 10m 14s	remaining: 10m 21s
497:	learn: 0.4220226	total: 10m 15s	remaining: 10m 20s
498:	learn: 0.4219331	total: 10m 16s	remaining: 10m 18s
499:	learn: 0.4218977	total: 10m 17s	remaining: 10m 17s
500:	learn: 0.4218346	total: 10m 18s	remaining: 10m 15s
501:	learn: 0.4218001	total: 10m 19s	remaining: 10m 14s
502:	learn: 0.4217719	total: 10m 20s	remaining: 10m 13s
503:	learn: 0.4217355	total: 10m 24s	remaining: 10m 14s
504:	learn: 0.4217116	total: 10m 25s	remaining: 10m 13s
505:	learn: 0.4216446	total: 10m 26s	remaining: 10m 11s
506:	learn: 0.4215936	total: 10m 30s	remaining: 10m 12s
507:	learn: 0.4215634	total: 10m 31s	remaining: 10m 11s
508:	learn: 0.4215370	total: 10m 32s	remaining: 10m 10s
509:	learn: 0.4214698	total: 10m 33s	remaining: 10m 8s
510:	learn: 0.4214449	total: 10m 35s	remaining: 10m 8s
511:	learn: 0.4214052	total: 10m 36s	remaining: 10m 6s
512:	learn: 0.4213883	total: 10m 37s	remaining: 10m 5s
513:	learn: 0.4213451	total: 10m 38s	remaining: 10m 3s
514:	learn: 0.4211691	total: 10m 39s	remaining: 10m 1s

515:	learn: 0.4211360	total: 10m 39s	remaining: 10m
516:	learn: 0.4211222	total: 10m 40s	remaining: 9m 58s
517:	learn: 0.4210668	total: 10m 41s	remaining: 9m 56s
518:	learn: 0.4210241	total: 10m 41s	remaining: 9m 54s
519:	learn: 0.4210056	total: 10m 43s	remaining: 9m 53s
520:	learn: 0.4209881	total: 10m 44s	remaining: 9m 52s
521:	learn: 0.4209470	total: 10m 45s	remaining: 9m 51s
522:	learn: 0.4209290	total: 10m 46s	remaining: 9m 49s
523:	learn: 0.4208850	total: 10m 47s	remaining: 9m 48s
524:	learn: 0.4208645	total: 10m 48s	remaining: 9m 46s
525:	learn: 0.4208285	total: 10m 49s	remaining: 9m 45s
526:	learn: 0.4208067	total: 10m 50s	remaining: 9m 44s
527:	learn: 0.4207711	total: 10m 51s	remaining: 9m 42s
528:	learn: 0.4207349	total: 10m 52s	remaining: 9m 41s
529:	learn: 0.4207212	total: 10m 54s	remaining: 9m 40s
530:	learn: 0.4207106	total: 10m 54s	remaining: 9m 38s
531:	learn: 0.4206755	total: 10m 55s	remaining: 9m 37s
532:	learn: 0.4206164	total: 10m 57s	remaining: 9m 35s
533:	learn: 0.4205793	total: 10m 57s	remaining: 9m 34s
534:	learn: 0.4203971	total: 10m 59s	remaining: 9m 33s
535:	learn: 0.4203322	total: 11m	remaining: 9m 31s
536:	learn: 0.4203041	total: 11m 1s	remaining: 9m 29s
537:	learn: 0.4202961	total: 11m 2s	remaining: 9m 28s
538:	learn: 0.4202018	total: 11m 3s	remaining: 9m 27s
539:	learn: 0.4201570	total: 11m 6s	remaining: 9m 27s
540:	learn: 0.4200648	total: 11m 7s	remaining: 9m 26s
541:	learn: 0.4198052	total: 11m 10s	remaining: 9m 26s
542:	learn: 0.4197724	total: 11m 10s	remaining: 9m 24s
543:	learn: 0.4197513	total: 11m 12s	remaining: 9m 23s
544:	learn: 0.4197174	total: 11m 13s	remaining: 9m 22s
545:	learn: 0.4196603	total: 11m 14s	remaining: 9m 20s
546:	learn: 0.4196054	total: 11m 15s	remaining: 9m 19s
547:	learn: 0.4195723	total: 11m 16s	remaining: 9m 17s
548:	learn: 0.4194619	total: 11m 19s	remaining: 9m 18s
549:	learn: 0.4194406	total: 11m 20s	remaining: 9m 16s
550:	learn: 0.4193929	total: 11m 21s	remaining: 9m 15s
551:	learn: 0.4193389	total: 11m 22s	remaining: 9m 13s
552:	learn: 0.4193351	total: 11m 23s	remaining: 9m 12s
553:	learn: 0.4192843	total: 11m 23s	remaining: 9m 10s
554:	learn: 0.4192398	total: 11m 24s	remaining: 9m 9s
555:	learn: 0.4191991	total: 11m 25s	remaining: 9m 7s
556:	learn: 0.4191539	total: 11m 26s	remaining: 9m 6s
557:	learn: 0.4191096	total: 11m 27s	remaining: 9m 4s

558:	learn: 0.4190974	total: 11m 28s	remaining: 9m 3s
559:	learn: 0.4190671	total: 11m 29s	remaining: 9m 1s
560:	learn: 0.4188045	total: 11m 32s	remaining: 9m 1s
561:	learn: 0.4187924	total: 11m 34s	remaining: 9m
562:	learn: 0.4187654	total: 11m 35s	remaining: 8m 59s
563:	learn: 0.4187362	total: 11m 36s	remaining: 8m 58s
564:	learn: 0.4186933	total: 11m 37s	remaining: 8m 57s
565:	learn: 0.4186734	total: 11m 38s	remaining: 8m 55s
566:	learn: 0.4186593	total: 11m 39s	remaining: 8m 54s
567:	learn: 0.4186030	total: 11m 40s	remaining: 8m 52s
568:	learn: 0.4185063	total: 11m 44s	remaining: 8m 53s
569:	learn: 0.4184559	total: 11m 45s	remaining: 8m 51s
570:	learn: 0.4184257	total: 11m 46s	remaining: 8m 50s
571:	learn: 0.4183974	total: 11m 47s	remaining: 8m 49s
572:	learn: 0.4183658	total: 11m 49s	remaining: 8m 48s
573:	learn: 0.4183369	total: 11m 50s	remaining: 8m 47s
574:	learn: 0.4183095	total: 11m 51s	remaining: 8m 45s
575:	learn: 0.4182779	total: 11m 52s	remaining: 8m 44s
576:	learn: 0.4182424	total: 11m 53s	remaining: 8m 43s
577:	learn: 0.4181916	total: 11m 54s	remaining: 8m 41s
578:	learn: 0.4181142	total: 11m 56s	remaining: 8m 40s
579:	learn: 0.4180794	total: 11m 57s	remaining: 8m 39s
580:	learn: 0.4180650	total: 11m 58s	remaining: 8m 37s
581:	learn: 0.4180265	total: 11m 59s	remaining: 8m 36s
582:	learn: 0.4180010	total: 12m	remaining: 8m 35s
583:	learn: 0.4179050	total: 12m 1s	remaining: 8m 34s
584:	learn: 0.4177868	total: 12m 5s	remaining: 8m 34s
585:	learn: 0.4177794	total: 12m 6s	remaining: 8m 33s
586:	learn: 0.4177406	total: 12m 7s	remaining: 8m 31s
587:	learn: 0.4177044	total: 12m 8s	remaining: 8m 30s
588:	learn: 0.4176555	total: 12m 9s	remaining: 8m 29s
589:	learn: 0.4175692	total: 12m 11s	remaining: 8m 28s
590:	learn: 0.4175582	total: 12m 12s	remaining: 8m 26s
591:	learn: 0.4175495	total: 12m 12s	remaining: 8m 25s
592:	learn: 0.4175124	total: 12m 14s	remaining: 8m 23s
593:	learn: 0.4173302	total: 12m 15s	remaining: 8m 22s
594:	learn: 0.4172959	total: 12m 16s	remaining: 8m 21s
595:	learn: 0.4172694	total: 12m 17s	remaining: 8m 19s
596:	learn: 0.4172556	total: 12m 18s	remaining: 8m 18s
597:	learn: 0.4172112	total: 12m 19s	remaining: 8m 16s
598:	learn: 0.4171750	total: 12m 20s	remaining: 8m 15s
599:	learn: 0.4171218	total: 12m 20s	remaining: 8m 13s
600:	learn: 0.4170772	total: 12m 21s	remaining: 8m 12s

601:	learn: 0.4170336	total: 12m 22s	remaining: 8m 11s
602:	learn: 0.4170185	total: 12m 24s	remaining: 8m 10s
603:	learn: 0.4169018	total: 12m 26s	remaining: 8m 9s
604:	learn: 0.4168922	total: 12m 27s	remaining: 8m 7s
605:	learn: 0.4168573	total: 12m 27s	remaining: 8m 6s
606:	learn: 0.4168291	total: 12m 29s	remaining: 8m 5s
607:	learn: 0.4168183	total: 12m 30s	remaining: 8m 3s
608:	learn: 0.4167933	total: 12m 31s	remaining: 8m 2s
609:	learn: 0.4167775	total: 12m 32s	remaining: 8m
610:	learn: 0.4167533	total: 12m 32s	remaining: 7m 59s
611:	learn: 0.4167438	total: 12m 33s	remaining: 7m 57s
612:	learn: 0.4167176	total: 12m 34s	remaining: 7m 56s
613:	learn: 0.4167081	total: 12m 36s	remaining: 7m 55s
614:	learn: 0.4166762	total: 12m 37s	remaining: 7m 53s
615:	learn: 0.4166603	total: 12m 38s	remaining: 7m 52s
616:	learn: 0.4166430	total: 12m 39s	remaining: 7m 51s
617:	learn: 0.4166333	total: 12m 40s	remaining: 7m 50s
618:	learn: 0.4166207	total: 12m 41s	remaining: 7m 48s
619:	learn: 0.4165211	total: 12m 42s	remaining: 7m 47s
620:	learn: 0.4165014	total: 12m 43s	remaining: 7m 45s
621:	learn: 0.4164801	total: 12m 44s	remaining: 7m 44s
622:	learn: 0.4164541	total: 12m 45s	remaining: 7m 42s
623:	learn: 0.4162209	total: 12m 47s	remaining: 7m 42s
624:	learn: 0.4161575	total: 12m 49s	remaining: 7m 41s
625:	learn: 0.4161207	total: 12m 51s	remaining: 7m 41s
626:	learn: 0.4161024	total: 12m 53s	remaining: 7m 40s
627:	learn: 0.4160658	total: 12m 54s	remaining: 7m 38s
628:	learn: 0.4160392	total: 12m 55s	remaining: 7m 37s
629:	learn: 0.4159146	total: 12m 58s	remaining: 7m 36s
630:	learn: 0.4157756	total: 13m 1s	remaining: 7m 37s
631:	learn: 0.4157459	total: 13m 3s	remaining: 7m 35s
632:	learn: 0.4156781	total: 13m 3s	remaining: 7m 34s
633:	learn: 0.4156666	total: 13m 4s	remaining: 7m 32s
634:	learn: 0.4156588	total: 13m 5s	remaining: 7m 31s
635:	learn: 0.4156005	total: 13m 6s	remaining: 7m 30s
636:	learn: 0.4155765	total: 13m 8s	remaining: 7m 29s
637:	learn: 0.4155609	total: 13m 9s	remaining: 7m 28s
638:	learn: 0.4155332	total: 13m 11s	remaining: 7m 27s
639:	learn: 0.4154993	total: 13m 12s	remaining: 7m 25s
640:	learn: 0.4154823	total: 13m 13s	remaining: 7m 24s
641:	learn: 0.4154578	total: 13m 15s	remaining: 7m 23s
642:	learn: 0.4153421	total: 13m 16s	remaining: 7m 22s
643:	learn: 0.4153355	total: 13m 17s	remaining: 7m 20s

644:	learn: 0.4152163	total: 13m 19s	remaining: 7m 20s
645:	learn: 0.4151750	total: 13m 21s	remaining: 7m 19s
646:	learn: 0.4151696	total: 13m 22s	remaining: 7m 17s
647:	learn: 0.4151618	total: 13m 22s	remaining: 7m 16s
648:	learn: 0.4151212	total: 13m 23s	remaining: 7m 14s
649:	learn: 0.4150641	total: 13m 24s	remaining: 7m 13s
650:	learn: 0.4150470	total: 13m 25s	remaining: 7m 11s
651:	learn: 0.4149910	total: 13m 26s	remaining: 7m 10s
652:	learn: 0.4149532	total: 13m 28s	remaining: 7m 9s
653:	learn: 0.4149162	total: 13m 29s	remaining: 7m 8s
654:	learn: 0.4148746	total: 13m 30s	remaining: 7m 6s
655:	learn: 0.4148654	total: 13m 31s	remaining: 7m 5s
656:	learn: 0.4147916	total: 13m 32s	remaining: 7m 4s
657:	learn: 0.4147775	total: 13m 33s	remaining: 7m 2s
658:	learn: 0.4147309	total: 13m 34s	remaining: 7m 1s
659:	learn: 0.4147041	total: 13m 35s	remaining: 7m
660:	learn: 0.4146772	total: 13m 36s	remaining: 6m 58s
661:	learn: 0.4146698	total: 13m 37s	remaining: 6m 57s
662:	learn: 0.4146601	total: 13m 38s	remaining: 6m 55s
663:	learn: 0.4146427	total: 13m 38s	remaining: 6m 54s
664:	learn: 0.4146189	total: 13m 39s	remaining: 6m 52s
665:	learn: 0.4146069	total: 13m 41s	remaining: 6m 51s
666:	learn: 0.4146019	total: 13m 42s	remaining: 6m 50s
667:	learn: 0.4144997	total: 13m 43s	remaining: 6m 49s
668:	learn: 0.4144836	total: 13m 44s	remaining: 6m 47s
669:	learn: 0.4144504	total: 13m 46s	remaining: 6m 46s
670:	learn: 0.4143627	total: 13m 47s	remaining: 6m 45s
671:	learn: 0.4143069	total: 13m 48s	remaining: 6m 44s
672:	learn: 0.4142812	total: 13m 49s	remaining: 6m 42s
673:	learn: 0.4142686	total: 13m 50s	remaining: 6m 41s
674:	learn: 0.4142339	total: 13m 51s	remaining: 6m 40s
675:	learn: 0.4141616	total: 13m 52s	remaining: 6m 38s
676:	learn: 0.4141543	total: 13m 53s	remaining: 6m 37s
677:	learn: 0.4141402	total: 13m 54s	remaining: 6m 36s
678:	learn: 0.4141090	total: 13m 55s	remaining: 6m 34s
679:	learn: 0.4140591	total: 13m 56s	remaining: 6m 33s
680:	learn: 0.4140396	total: 13m 57s	remaining: 6m 32s
681:	learn: 0.4140256	total: 13m 58s	remaining: 6m 31s
682:	learn: 0.4140061	total: 14m	remaining: 6m 29s
683:	learn: 0.4139775	total: 14m	remaining: 6m 28s
684:	learn: 0.4139537	total: 14m 1s	remaining: 6m 26s
685:	learn: 0.4139313	total: 14m 2s	remaining: 6m 25s
686:	learn: 0.4139177	total: 14m 3s	remaining: 6m 24s

687:	learn: 0.4138451	total: 14m 4s	remaining: 6m 22s
688:	learn: 0.4137536	total: 14m 4s	remaining: 6m 21s
689:	learn: 0.4137482	total: 14m 5s	remaining: 6m 19s
690:	learn: 0.4136831	total: 14m 7s	remaining: 6m 18s
691:	learn: 0.4136557	total: 14m 11s	remaining: 6m 18s
692:	learn: 0.4136376	total: 14m 12s	remaining: 6m 17s
693:	learn: 0.4135737	total: 14m 13s	remaining: 6m 16s
694:	learn: 0.4135521	total: 14m 14s	remaining: 6m 14s
695:	learn: 0.4135173	total: 14m 15s	remaining: 6m 13s
696:	learn: 0.4134180	total: 14m 18s	remaining: 6m 13s
697:	learn: 0.4134057	total: 14m 20s	remaining: 6m 12s
698:	learn: 0.4133821	total: 14m 21s	remaining: 6m 10s
699:	learn: 0.4132964	total: 14m 22s	remaining: 6m 9s
700:	learn: 0.4131713	total: 14m 23s	remaining: 6m 8s
701:	learn: 0.4131547	total: 14m 24s	remaining: 6m 7s
702:	learn: 0.4130226	total: 14m 25s	remaining: 6m 5s
703:	learn: 0.4128950	total: 14m 29s	remaining: 6m 5s
704:	learn: 0.4127259	total: 14m 31s	remaining: 6m 4s
705:	learn: 0.4127108	total: 14m 33s	remaining: 6m 3s
706:	learn: 0.4126747	total: 14m 34s	remaining: 6m 2s
707:	learn: 0.4126588	total: 14m 35s	remaining: 6m
708:	learn: 0.4126447	total: 14m 36s	remaining: 5m 59s
709:	learn: 0.4126167	total: 14m 37s	remaining: 5m 58s
710:	learn: 0.4126004	total: 14m 37s	remaining: 5m 56s
711:	learn: 0.4125582	total: 14m 38s	remaining: 5m 55s
712:	learn: 0.4125010	total: 14m 39s	remaining: 5m 53s
713:	learn: 0.4124787	total: 14m 41s	remaining: 5m 52s
714:	learn: 0.4124655	total: 14m 42s	remaining: 5m 51s
715:	learn: 0.4124324	total: 14m 42s	remaining: 5m 50s
716:	learn: 0.4124107	total: 14m 43s	remaining: 5m 48s
717:	learn: 0.4123743	total: 14m 45s	remaining: 5m 47s
718:	learn: 0.4123658	total: 14m 46s	remaining: 5m 46s
719:	learn: 0.4123181	total: 14m 46s	remaining: 5m 44s
720:	learn: 0.4122694	total: 14m 48s	remaining: 5m 43s
721:	learn: 0.4121770	total: 14m 48s	remaining: 5m 42s
722:	learn: 0.4121697	total: 14m 50s	remaining: 5m 41s
723:	learn: 0.4121524	total: 14m 51s	remaining: 5m 39s
724:	learn: 0.4121089	total: 14m 52s	remaining: 5m 38s
725:	learn: 0.4120972	total: 14m 53s	remaining: 5m 37s
726:	learn: 0.4120630	total: 14m 55s	remaining: 5m 36s
727:	learn: 0.4120148	total: 14m 56s	remaining: 5m 34s
728:	learn: 0.4119811	total: 14m 56s	remaining: 5m 33s
729:	learn: 0.4119391	total: 14m 58s	remaining: 5m 32s

730:	learn: 0.4119078	total: 14m 58s	remaining: 5m 30s
731:	learn: 0.4117623	total: 14m 59s	remaining: 5m 29s
732:	learn: 0.4117354	total: 15m 2s	remaining: 5m 28s
733:	learn: 0.4117186	total: 15m 3s	remaining: 5m 27s
734:	learn: 0.4116676	total: 15m 5s	remaining: 5m 26s
735:	learn: 0.4116441	total: 15m 6s	remaining: 5m 25s
736:	learn: 0.4116279	total: 15m 7s	remaining: 5m 23s
737:	learn: 0.4116161	total: 15m 8s	remaining: 5m 22s
738:	learn: 0.4115938	total: 15m 8s	remaining: 5m 21s
739:	learn: 0.4115787	total: 15m 9s	remaining: 5m 19s
740:	learn: 0.4115264	total: 15m 11s	remaining: 5m 18s
741:	learn: 0.4115009	total: 15m 12s	remaining: 5m 17s
742:	learn: 0.4114767	total: 15m 13s	remaining: 5m 16s
743:	learn: 0.4114585	total: 15m 15s	remaining: 5m 14s
744:	learn: 0.4114218	total: 15m 15s	remaining: 5m 13s
745:	learn: 0.4114130	total: 15m 16s	remaining: 5m 12s
746:	learn: 0.4113890	total: 15m 17s	remaining: 5m 10s
747:	learn: 0.4113752	total: 15m 18s	remaining: 5m 9s
748:	learn: 0.4113606	total: 15m 18s	remaining: 5m 7s
749:	learn: 0.4113524	total: 15m 19s	remaining: 5m 6s
750:	learn: 0.4113469	total: 15m 20s	remaining: 5m 5s
751:	learn: 0.4113244	total: 15m 21s	remaining: 5m 3s
752:	learn: 0.4113149	total: 15m 22s	remaining: 5m 2s
753:	learn: 0.4112970	total: 15m 23s	remaining: 5m 1s
754:	learn: 0.4112740	total: 15m 24s	remaining: 5m
755:	learn: 0.4112555	total: 15m 25s	remaining: 4m 58s
756:	learn: 0.4112369	total: 15m 26s	remaining: 4m 57s
757:	learn: 0.4112082	total: 15m 27s	remaining: 4m 55s
758:	learn: 0.4111942	total: 15m 28s	remaining: 4m 54s
759:	learn: 0.4111513	total: 15m 29s	remaining: 4m 53s
760:	learn: 0.4111351	total: 15m 31s	remaining: 4m 52s
761:	learn: 0.4110949	total: 15m 32s	remaining: 4m 51s
762:	learn: 0.4110597	total: 15m 33s	remaining: 4m 49s
763:	learn: 0.4110312	total: 15m 34s	remaining: 4m 48s
764:	learn: 0.4110075	total: 15m 35s	remaining: 4m 47s
765:	learn: 0.4109382	total: 15m 36s	remaining: 4m 45s
766:	learn: 0.4109200	total: 15m 37s	remaining: 4m 44s
767:	learn: 0.4109107	total: 15m 38s	remaining: 4m 43s
768:	learn: 0.4108873	total: 15m 40s	remaining: 4m 42s
769:	learn: 0.4108720	total: 15m 41s	remaining: 4m 41s
770:	learn: 0.4108622	total: 15m 41s	remaining: 4m 39s
771:	learn: 0.4108352	total: 15m 42s	remaining: 4m 38s
772:	learn: 0.4107952	total: 15m 43s	remaining: 4m 37s

773:	learn: 0.4107506	total: 15m 44s	remaining: 4m 35s
774:	learn: 0.4107366	total: 15m 45s	remaining: 4m 34s
775:	learn: 0.4107273	total: 15m 47s	remaining: 4m 33s
776:	learn: 0.4107094	total: 15m 48s	remaining: 4m 32s
777:	learn: 0.4105911	total: 15m 49s	remaining: 4m 30s
778:	learn: 0.4105705	total: 15m 50s	remaining: 4m 29s
779:	learn: 0.4105157	total: 15m 52s	remaining: 4m 28s
780:	learn: 0.4104047	total: 15m 55s	remaining: 4m 27s
781:	learn: 0.4103647	total: 15m 56s	remaining: 4m 26s
782:	learn: 0.4103134	total: 15m 57s	remaining: 4m 25s
783:	learn: 0.4102957	total: 15m 57s	remaining: 4m 23s
784:	learn: 0.4102739	total: 15m 58s	remaining: 4m 22s
785:	learn: 0.4102275	total: 15m 59s	remaining: 4m 21s
786:	learn: 0.4102022	total: 16m	remaining: 4m 20s
787:	learn: 0.4101887	total: 16m 2s	remaining: 4m 18s
788:	learn: 0.4100826	total: 16m 4s	remaining: 4m 17s
789:	learn: 0.4100543	total: 16m 5s	remaining: 4m 16s
790:	learn: 0.4099388	total: 16m 6s	remaining: 4m 15s
791:	learn: 0.4099234	total: 16m 7s	remaining: 4m 14s
792:	learn: 0.4099018	total: 16m 8s	remaining: 4m 12s
793:	learn: 0.4098658	total: 16m 10s	remaining: 4m 11s
794:	learn: 0.4098533	total: 16m 11s	remaining: 4m 10s
795:	learn: 0.4098444	total: 16m 12s	remaining: 4m 9s
796:	learn: 0.4098214	total: 16m 12s	remaining: 4m 7s
797:	learn: 0.4098108	total: 16m 13s	remaining: 4m 6s
798:	learn: 0.4097488	total: 16m 14s	remaining: 4m 5s
799:	learn: 0.4097011	total: 16m 15s	remaining: 4m 3s
800:	learn: 0.4096247	total: 16m 16s	remaining: 4m 2s
801:	learn: 0.4096055	total: 16m 17s	remaining: 4m 1s
802:	learn: 0.4095911	total: 16m 18s	remaining: 4m
803:	learn: 0.4095642	total: 16m 19s	remaining: 3m 58s
804:	learn: 0.4095131	total: 16m 23s	remaining: 3m 58s
805:	learn: 0.4094756	total: 16m 24s	remaining: 3m 57s
806:	learn: 0.4094681	total: 16m 25s	remaining: 3m 55s
807:	learn: 0.4094347	total: 16m 27s	remaining: 3m 54s
808:	learn: 0.4094111	total: 16m 28s	remaining: 3m 53s
809:	learn: 0.4094015	total: 16m 28s	remaining: 3m 51s
810:	learn: 0.4093378	total: 16m 29s	remaining: 3m 50s
811:	learn: 0.4093046	total: 16m 30s	remaining: 3m 49s
812:	learn: 0.4092597	total: 16m 31s	remaining: 3m 48s
813:	learn: 0.4092469	total: 16m 32s	remaining: 3m 46s
814:	learn: 0.4092213	total: 16m 33s	remaining: 3m 45s
815:	learn: 0.4091885	total: 16m 34s	remaining: 3m 44s

816:	learn: 0.4091624	total: 16m 34s	remaining: 3m 42s
817:	learn: 0.4091445	total: 16m 35s	remaining: 3m 41s
818:	learn: 0.4091161	total: 16m 36s	remaining: 3m 40s
819:	learn: 0.4090963	total: 16m 37s	remaining: 3m 38s
820:	learn: 0.4090864	total: 16m 38s	remaining: 3m 37s
821:	learn: 0.4090623	total: 16m 38s	remaining: 3m 36s
822:	learn: 0.4090052	total: 16m 40s	remaining: 3m 35s
823:	learn: 0.4089778	total: 16m 41s	remaining: 3m 33s
824:	learn: 0.4089535	total: 16m 41s	remaining: 3m 32s
825:	learn: 0.4089292	total: 16m 42s	remaining: 3m 31s
826:	learn: 0.4088920	total: 16m 43s	remaining: 3m 29s
827:	learn: 0.4088826	total: 16m 44s	remaining: 3m 28s
828:	learn: 0.4088654	total: 16m 46s	remaining: 3m 27s
829:	learn: 0.4088426	total: 16m 47s	remaining: 3m 26s
830:	learn: 0.4088305	total: 16m 48s	remaining: 3m 25s
831:	learn: 0.4087994	total: 16m 48s	remaining: 3m 23s
832:	learn: 0.4087772	total: 16m 50s	remaining: 3m 22s
833:	learn: 0.4087302	total: 16m 54s	remaining: 3m 21s
834:	learn: 0.4087161	total: 16m 54s	remaining: 3m 20s
835:	learn: 0.4086702	total: 16m 55s	remaining: 3m 19s
836:	learn: 0.4086612	total: 16m 56s	remaining: 3m 17s
837:	learn: 0.4086568	total: 16m 57s	remaining: 3m 16s
838:	learn: 0.4086448	total: 16m 57s	remaining: 3m 15s
839:	learn: 0.4086209	total: 16m 59s	remaining: 3m 14s
840:	learn: 0.4086039	total: 17m	remaining: 3m 12s
841:	learn: 0.4085587	total: 17m 1s	remaining: 3m 11s
842:	learn: 0.4085178	total: 17m 2s	remaining: 3m 10s
843:	learn: 0.4084628	total: 17m 2s	remaining: 3m 9s
844:	learn: 0.4084436	total: 17m 4s	remaining: 3m 7s
845:	learn: 0.4084304	total: 17m 5s	remaining: 3m 6s
846:	learn: 0.4083697	total: 17m 6s	remaining: 3m 5s
847:	learn: 0.4083300	total: 17m 6s	remaining: 3m 4s
848:	learn: 0.4083058	total: 17m 9s	remaining: 3m 3s
849:	learn: 0.4082859	total: 17m 10s	remaining: 3m 1s
850:	learn: 0.4082615	total: 17m 11s	remaining: 3m
851:	learn: 0.4082426	total: 17m 12s	remaining: 2m 59s
852:	learn: 0.4082277	total: 17m 13s	remaining: 2m 58s
853:	learn: 0.4081760	total: 17m 13s	remaining: 2m 56s
854:	learn: 0.4081554	total: 17m 14s	remaining: 2m 55s
855:	learn: 0.4081121	total: 17m 15s	remaining: 2m 54s
856:	learn: 0.4080801	total: 17m 16s	remaining: 2m 52s
857:	learn: 0.4080616	total: 17m 18s	remaining: 2m 51s
858:	learn: 0.4080285	total: 17m 18s	remaining: 2m 50s

859:	learn: 0.4079786	total: 17m 19s	remaining: 2m 49s
860:	learn: 0.4079449	total: 17m 20s	remaining: 2m 48s
861:	learn: 0.4079378	total: 17m 21s	remaining: 2m 46s
862:	learn: 0.4079116	total: 17m 22s	remaining: 2m 45s
863:	learn: 0.4078534	total: 17m 23s	remaining: 2m 44s
864:	learn: 0.4077948	total: 17m 24s	remaining: 2m 43s
865:	learn: 0.4077887	total: 17m 25s	remaining: 2m 41s
866:	learn: 0.4077490	total: 17m 26s	remaining: 2m 40s
867:	learn: 0.4077441	total: 17m 26s	remaining: 2m 39s
868:	learn: 0.4077274	total: 17m 27s	remaining: 2m 37s
869:	learn: 0.4077099	total: 17m 28s	remaining: 2m 36s
870:	learn: 0.4076999	total: 17m 29s	remaining: 2m 35s
871:	learn: 0.4076973	total: 17m 30s	remaining: 2m 34s
872:	learn: 0.4076879	total: 17m 30s	remaining: 2m 32s
873:	learn: 0.4076627	total: 17m 31s	remaining: 2m 31s
874:	learn: 0.4076192	total: 17m 32s	remaining: 2m 30s
875:	learn: 0.4075892	total: 17m 33s	remaining: 2m 29s
876:	learn: 0.4075820	total: 17m 34s	remaining: 2m 27s
877:	learn: 0.4075696	total: 17m 35s	remaining: 2m 26s
878:	learn: 0.4075516	total: 17m 35s	remaining: 2m 25s
879:	learn: 0.4075070	total: 17m 36s	remaining: 2m 24s
880:	learn: 0.4075006	total: 17m 37s	remaining: 2m 22s
881:	learn: 0.4074801	total: 17m 37s	remaining: 2m 21s
882:	learn: 0.4074660	total: 17m 38s	remaining: 2m 20s
883:	learn: 0.4074250	total: 17m 39s	remaining: 2m 19s
884:	learn: 0.4074150	total: 17m 40s	remaining: 2m 17s
885:	learn: 0.4074043	total: 17m 41s	remaining: 2m 16s
886:	learn: 0.4073255	total: 17m 42s	remaining: 2m 15s
887:	learn: 0.4073226	total: 17m 43s	remaining: 2m 14s
888:	learn: 0.4072928	total: 17m 44s	remaining: 2m 12s
889:	learn: 0.4072547	total: 17m 44s	remaining: 2m 11s
890:	learn: 0.4072335	total: 17m 45s	remaining: 2m 10s
891:	learn: 0.4072281	total: 17m 46s	remaining: 2m 9s
892:	learn: 0.4072201	total: 17m 47s	remaining: 2m 7s
893:	learn: 0.4072049	total: 17m 48s	remaining: 2m 6s
894:	learn: 0.4071848	total: 17m 49s	remaining: 2m 5s
895:	learn: 0.4071515	total: 17m 52s	remaining: 2m 4s
896:	learn: 0.4070835	total: 17m 53s	remaining: 2m 3s
897:	learn: 0.4070832	total: 17m 54s	remaining: 2m 2s
898:	learn: 0.4070776	total: 17m 54s	remaining: 2m
899:	learn: 0.4070598	total: 17m 57s	remaining: 1m 59s
900:	learn: 0.4070383	total: 17m 57s	remaining: 1m 58s
901:	learn: 0.4070352	total: 17m 58s	remaining: 1m 57s

902:	learn: 0.4070249	total: 17m 59s	remaining: 1m 55s
903:	learn: 0.4069457	total: 18m 1s	remaining: 1m 54s
904:	learn: 0.4069012	total: 18m 2s	remaining: 1m 53s
905:	learn: 0.4068686	total: 18m 3s	remaining: 1m 52s
906:	learn: 0.4068511	total: 18m 5s	remaining: 1m 51s
907:	learn: 0.4067734	total: 18m 6s	remaining: 1m 50s
908:	learn: 0.4067647	total: 18m 7s	remaining: 1m 48s
909:	learn: 0.4067524	total: 18m 7s	remaining: 1m 47s
910:	learn: 0.4067294	total: 18m 8s	remaining: 1m 46s
911:	learn: 0.4067184	total: 18m 9s	remaining: 1m 45s
912:	learn: 0.4066997	total: 18m 10s	remaining: 1m 43s
913:	learn: 0.4066830	total: 18m 11s	remaining: 1m 42s
914:	learn: 0.4066594	total: 18m 12s	remaining: 1m 41s
915:	learn: 0.4066419	total: 18m 13s	remaining: 1m 40s
916:	learn: 0.4065802	total: 18m 13s	remaining: 1m 39s
917:	learn: 0.4065629	total: 18m 14s	remaining: 1m 37s
918:	learn: 0.4064900	total: 18m 16s	remaining: 1m 36s
919:	learn: 0.4064549	total: 18m 17s	remaining: 1m 35s
920:	learn: 0.4062921	total: 18m 18s	remaining: 1m 34s
921:	learn: 0.4062705	total: 18m 19s	remaining: 1m 33s
922:	learn: 0.4062645	total: 18m 20s	remaining: 1m 31s
923:	learn: 0.4062311	total: 18m 21s	remaining: 1m 30s
924:	learn: 0.4062059	total: 18m 23s	remaining: 1m 29s
925:	learn: 0.4061575	total: 18m 24s	remaining: 1m 28s
926:	learn: 0.4061161	total: 18m 27s	remaining: 1m 27s
927:	learn: 0.4060986	total: 18m 28s	remaining: 1m 26s
928:	learn: 0.4060908	total: 18m 29s	remaining: 1m 24s
929:	learn: 0.4060128	total: 18m 31s	remaining: 1m 23s
930:	learn: 0.4059990	total: 18m 32s	remaining: 1m 22s
931:	learn: 0.4059829	total: 18m 33s	remaining: 1m 21s
932:	learn: 0.4059379	total: 18m 34s	remaining: 1m 20s
933:	learn: 0.4059126	total: 18m 35s	remaining: 1m 18s
934:	learn: 0.4058877	total: 18m 35s	remaining: 1m 17s
935:	learn: 0.4058698	total: 18m 36s	remaining: 1m 16s
936:	learn: 0.4058522	total: 18m 37s	remaining: 1m 15s
937:	learn: 0.4058207	total: 18m 38s	remaining: 1m 13s
938:	learn: 0.4058006	total: 18m 38s	remaining: 1m 12s
939:	learn: 0.4056552	total: 18m 40s	remaining: 1m 11s
940:	learn: 0.4056387	total: 18m 41s	remaining: 1m 10s
941:	learn: 0.4056299	total: 18m 42s	remaining: 1m 9s
942:	learn: 0.4056128	total: 18m 43s	remaining: 1m 7s
943:	learn: 0.4055856	total: 18m 44s	remaining: 1m 6s
944:	learn: 0.4055727	total: 18m 45s	remaining: 1m 5s

945:	learn: 0.4055442	total: 18m 45s	remaining: 1m 4s
946:	learn: 0.4055311	total: 18m 46s	remaining: 1m 3s
947:	learn: 0.4054969	total: 18m 47s	remaining: 1m 1s
948:	learn: 0.4054122	total: 18m 48s	remaining: 1m
949:	learn: 0.4053649	total: 18m 49s	remaining: 59.4s
950:	learn: 0.4053518	total: 18m 51s	remaining: 58.3s
951:	learn: 0.4053145	total: 18m 53s	remaining: 57.2s
952:	learn: 0.4053116	total: 18m 54s	remaining: 56s
953:	learn: 0.4052700	total: 18m 56s	remaining: 54.8s
954:	learn: 0.4052528	total: 18m 58s	remaining: 53.6s
955:	learn: 0.4052391	total: 18m 59s	remaining: 52.4s
956:	learn: 0.4052200	total: 18m 59s	remaining: 51.2s
957:	learn: 0.4051802	total: 19m	remaining: 50s
958:	learn: 0.4051726	total: 19m 1s	remaining: 48.8s
959:	learn: 0.4051485	total: 19m 1s	remaining: 47.6s
960:	learn: 0.4051320	total: 19m 2s	remaining: 46.4s
961:	learn: 0.4051058	total: 19m 3s	remaining: 45.2s
962:	learn: 0.4050891	total: 19m 4s	remaining: 44s
963:	learn: 0.4050197	total: 19m 5s	remaining: 42.8s
964:	learn: 0.4050072	total: 19m 6s	remaining: 41.6s
965:	learn: 0.4049905	total: 19m 7s	remaining: 40.4s
966:	learn: 0.4049651	total: 19m 8s	remaining: 39.2s
967:	learn: 0.4049426	total: 19m 9s	remaining: 38s
968:	learn: 0.4049172	total: 19m 10s	remaining: 36.8s
969:	learn: 0.4048604	total: 19m 13s	remaining: 35.7s
970:	learn: 0.4048160	total: 19m 14s	remaining: 34.5s
971:	learn: 0.4047913	total: 19m 14s	remaining: 33.3s
972:	learn: 0.4047879	total: 19m 16s	remaining: 32.1s
973:	learn: 0.4047804	total: 19m 16s	remaining: 30.9s
974:	learn: 0.4047742	total: 19m 17s	remaining: 29.7s
975:	learn: 0.4047384	total: 19m 18s	remaining: 28.5s
976:	learn: 0.4047171	total: 19m 19s	remaining: 27.3s
977:	learn: 0.4046458	total: 19m 20s	remaining: 26.1s
978:	learn: 0.4046342	total: 19m 20s	remaining: 24.9s
979:	learn: 0.4046271	total: 19m 21s	remaining: 23.7s
980:	learn: 0.4046084	total: 19m 22s	remaining: 22.5s
981:	learn: 0.4045491	total: 19m 23s	remaining: 21.3s
982:	learn: 0.4045345	total: 19m 24s	remaining: 20.1s
983:	learn: 0.4045231	total: 19m 26s	remaining: 19s
984:	learn: 0.4044805	total: 19m 26s	remaining: 17.8s
985:	learn: 0.4044592	total: 19m 27s	remaining: 16.6s
986:	learn: 0.4044520	total: 19m 28s	remaining: 15.4s
987:	learn: 0.4044427	total: 19m 28s	remaining: 14.2s

988:	learn: 0.4044022	total: 19m 30s	remaining: 13s
989:	learn: 0.4043678	total: 19m 31s	remaining: 11.8s
990:	learn: 0.4043436	total: 19m 31s	remaining: 10.6s
991:	learn: 0.4043361	total: 19m 32s	remaining: 9.46s
992:	learn: 0.4042979	total: 19m 33s	remaining: 8.27s
993:	learn: 0.4042633	total: 19m 33s	remaining: 7.09s
994:	learn: 0.4042504	total: 19m 34s	remaining: 5.9s
995:	learn: 0.4042310	total: 19m 35s	remaining: 4.72s
996:	learn: 0.4042131	total: 19m 35s	remaining: 3.54s
997:	learn: 0.4041764	total: 19m 36s	remaining: 2.36s
998:	learn: 0.4041591	total: 19m 37s	remaining: 1.18s
999:	learn: 0.4041403	total: 19m 38s	remaining: 0us

Out[186]: <catboost.core.CatBoostClassifier at 0x7f10a7226748>

```
In [187]: import pickle
pickle.dump(model, open('catboost_model.pkl', 'wb'))
```

Evaluating Results

Identify Important Features

Lets find out which features are more important than other.

```
In [188]: feature_importance_df = pd.DataFrame(zip(model.feature_names_, model.feature_importances_),
        columns=['Feature', 'Importance']).set_index('Feature').sort_values(by='Importance', ascending=False).head(25)
```

```
In [189]: feature_importance_df = feature_importance_df.reset_index(level=0)
```

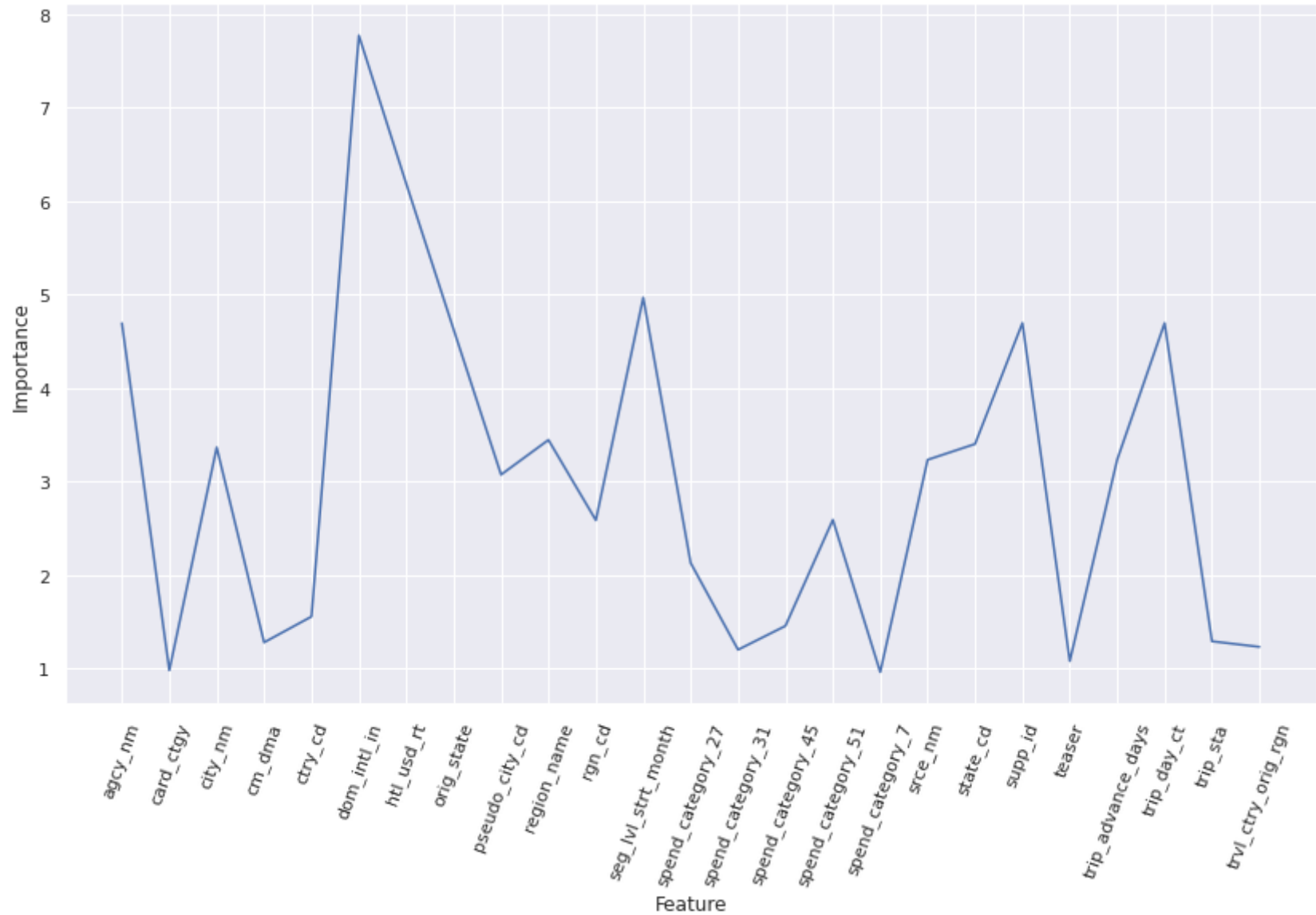
```
In [190]: feature_importance_df
```

Out[190]:

	Feature	Importance
0	dom_intl_in	7.774491
1	htl_usd_rt	6.186442
2	seg_lvl_strt_month	4.968089
3	supp_id	4.695541
4	trip_day_ct	4.694949
5	agcy_nm	4.693970
6	orig_state	4.625327
7	region_name	3.444028
8	state_cd	3.400246
9	city_nm	3.364039
10	trip_advance_days	3.232990
11	srce_nm	3.231522
12	pseudo_city_cd	3.072091
13	spend_category_51	2.588448
14	rgn_cd	2.584223
15	spend_category_27	2.127156
16	ctry_cd	1.552646
17	spend_category_45	1.452775
18	trip_sta	1.288018
19	cm_dma	1.276141
20	trvl_ctry_orig_rgn	1.228310
21	spend_category_31	1.197633
22	teaser	1.076034
23	card_ctgy	0.976896
24	spend_category_7	0.958227

```
In [191]: import seaborn as sns
import matplotlib.pyplot as plt

# draw lineplot
sns.set(rc={'figure.figsize':(11.7,8.27)})
sns.lineplot(x="Feature", y="Importance", data=feature_importance_df)
plt.xticks(rotation=70)
plt.tight_layout()
```



Shap Values

```
In [192]: # X=X_train.drop(columns=['person_id']), y=y_train
from catboost import *
import shap

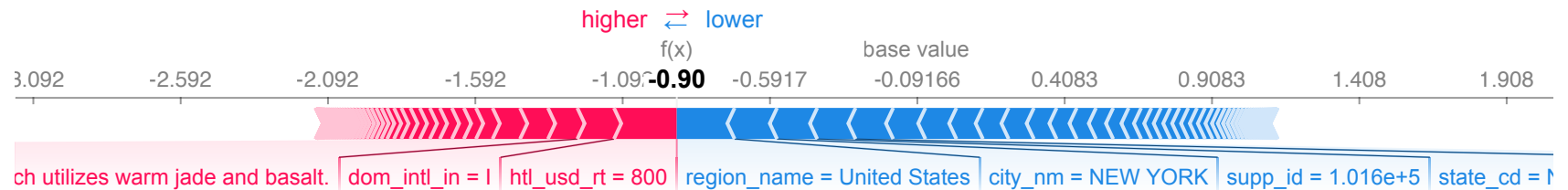
explainer = shap.TreeExplainer(model)
shap_values = explainer.shap_values(X_train.drop(columns=['person_id']))
```

```
In [193]: shap.initjs()
```

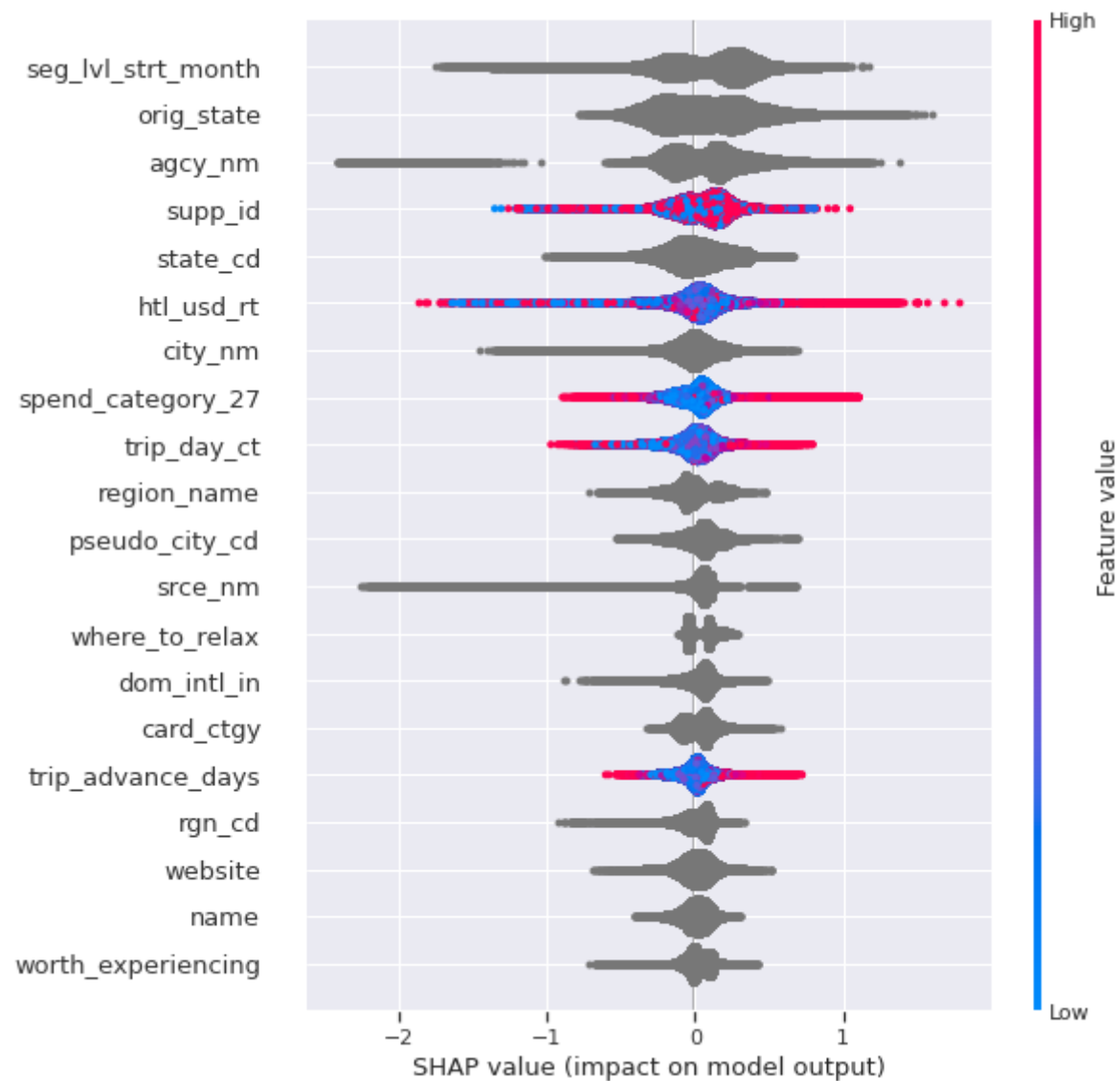


```
In [194]: # visualize the first prediction's explanation
shap.force_plot(explainer.expected_value, shap_values[0,:], X_train.drop(columns=['person_id']).iloc[0,:])
```

Out[194]:



```
In [195]: # visualize the training set predictions  
shap.summary_plot(shap_values, X_train.drop(columns=[ 'person_id' ]))
```

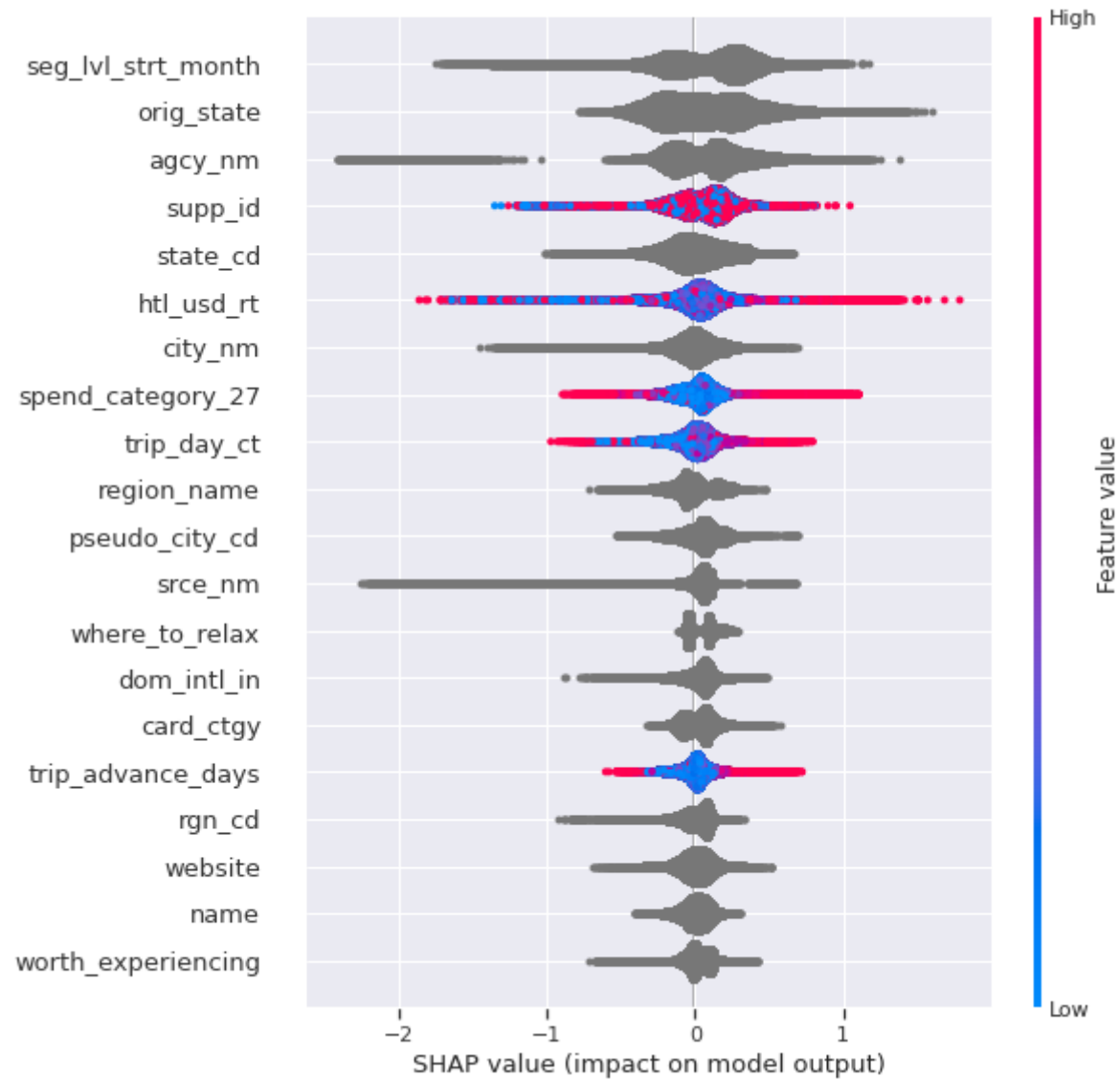



```
In [196]: print(model.get_all_params())
```

```
{'nan_mode': 'Min', 'eval_metric': 'Logloss', 'combinations_ctr': ['Borders:CtrBorderCount=15:CtrBorderType=Uniform:TargetBorderCount=1:TargetBorderType=MinEntropy:Prior=0/1:Prior=0.5/1:Prior=1/1', 'Counter:CtrBorderCount=15:CtrBorderType=Uniform:Prior=0/1'], 'iterations': 1000, 'sampling_frequency': 'PerTree', 'fold_permutation_block': 0, 'leaf_estimation_method': 'Newton', 'counter_calc_method': 'SkipTest', 'grow_policy': 'SymmetricTree', 'penalties_coefficient': 1, 'boosting_type': 'Plain', 'model_shrink_mode': 'Constant', 'feature_border_type': 'GreedyLogSum', 'ctr_leaf_count_limit': 18446744073709551615, 'bayesian_matrix_reg': 0.10000000149011612, 'one_hot_max_size': 2, 'l2_leaf_reg': 3, 'random_strength': 1, 'rsm': 1, 'boost_from_average': False, 'max_ctr_complexity': 4, 'model_size_reg': 0.5, 'simple_ctr': ['Borders:CtrBorderCount=15:CtrBorderType=Uniform:TargetBorderCount=1:TargetBorderType=MinEntropy:Prior=0/1:Prior=0.5/1:Prior=1/1', 'Counter:CtrBorderCount=15:CtrBorderType=Uniform:Prior=0/1'], 'pool_metainfo_options': {'tags': {}}, 'subsample': 0.800000011920929, 'use_best_model': False, 'class_names': [0, 1], 'random_seed': 0, 'depth': 6, 'ctr_target_border_count': 1, 'posterior_sampling': False, 'has_time': False, 'store_all_simple_ctr': False, 'border_count': 254, 'classes_count': 0, 'auto_class_weights': 'None', 'sparse_features_conflict_fraction': 0, 'leaf_estimation_backtracking': 'AnyImprovement', 'best_model_min_trees': 1, 'model_shrink_rate': 0, 'min_data_in_leaf': 1, 'loss_function': 'Logloss', 'learning_rate': 0.1739179939031601, 'score_function': 'Cosine', 'task_type': 'CPU', 'leaf_estimation_iterations': 10, 'bootstrap_type': 'MVS', 'max_leaves': 64, 'permutation_count': 4}
```

```
In [197]: explainer = shap.TreeExplainer(model)
shap_values = explainer.shap_values(Pool(X_train.drop(columns=['person_id']), y_train, cat_features=categorical_cols))
```

```
In [198]: shap.summary_plot(shap_values, X_train.drop(columns=['person_id']))
```



Classification Report

This is the classification report on the training dataset

```
In [199]: train_preds = pd.Series(model.predict(X_train.drop(columns=['person_id'])), index=X_train.index)

print("Train classification report:")
print(classification_report(y_train, train_preds))
```

```
Train classification report:
              precision    recall  f1-score   support

     0       0.97      0.83      0.89      374724
     1       0.85      0.97      0.91      374304

 accuracy              0.90      749028
  macro avg           0.91      0.90      0.90      749028
 weighted avg           0.91      0.90      0.90      749028
```

This is the classification report on the testing dataset

```
In [200]: test_preds = pd.Series(model.predict(X_test.drop(columns=['person_id'])), index=X_test.index)

print("Test classification report:")
print(classification_report(y_test, test_preds))
```

```
Test classification report:
              precision    recall  f1-score   support

     0       0.84      0.82      0.83      124628
     1       0.83      0.85      0.84      125048

 accuracy              0.83      249676
  macro avg           0.84      0.83      0.83      249676
 weighted avg           0.84      0.83      0.83      249676
```

Lets test this model for person ids who are in the testing set but not on the training set.

```
In [201]: test_only_users = X_test['person_id'].isin(set(X_test['person_id'].unique())-set(X_train['person_id'].unique()))

print(classification_report(y_test[test_only_users], test_preds[test_only_users]))
```

	precision	recall	f1-score	support
0	0.78	0.80	0.79	6066
1	0.79	0.78	0.79	6014
accuracy			0.79	12080
macro avg	0.79	0.79	0.79	12080
weighted avg	0.79	0.79	0.79	12080

Hyperparameter Tuning

Lets use a different loss function and a training directory

```
In [202]: ce_model = CatBoostClassifier(cat_features=categorical_cols, iterations=1000, loss_function = "CrossEntropy", train_dir = "crossentropy")
```

```
In [203]: ce_model.fit(X=X_train.drop(columns=['person_id']), y=y_train)
```

0:	learn: 0.6881479	total: 652ms	remaining: 10m 50s
1:	learn: 0.6831254	total: 1.24s	remaining: 10m 16s
2:	learn: 0.6783371	total: 1.9s	remaining: 10m 30s
3:	learn: 0.6737659	total: 2.65s	remaining: 11m
4:	learn: 0.6694864	total: 3.47s	remaining: 11m 29s
5:	learn: 0.6659550	total: 3.99s	remaining: 11m
6:	learn: 0.6621832	total: 4.65s	remaining: 10m 59s
7:	learn: 0.6586921	total: 5.28s	remaining: 10m 54s
8:	learn: 0.6554316	total: 5.87s	remaining: 10m 46s
9:	learn: 0.6523616	total: 6.46s	remaining: 10m 39s
10:	learn: 0.6496242	total: 7.06s	remaining: 10m 34s
11:	learn: 0.6468983	total: 7.53s	remaining: 10m 20s
12:	learn: 0.6443807	total: 8.1s	remaining: 10m 14s
13:	learn: 0.6420399	total: 8.69s	remaining: 10m 12s
14:	learn: 0.6398069	total: 9.23s	remaining: 10m 6s
15:	learn: 0.6377118	total: 9.72s	remaining: 9m 57s
16:	learn: 0.6357406	total: 10.2s	remaining: 9m 49s
17:	learn: 0.6328471	total: 10.7s	remaining: 9m 42s
18:	learn: 0.6301142	total: 11.1s	remaining: 9m 31s
19:	learn: 0.6276792	total: 11.5s	remaining: 9m 21s
20:	learn: 0.6253973	total: 11.9s	remaining: 9m 16s
21:	learn: 0.6227891	total: 12.5s	remaining: 9m 16s
22:	learn: 0.6199101	total: 13.3s	remaining: 9m 24s
23:	learn: 0.6171901	total: 14.6s	remaining: 9m 52s
24:	learn: 0.6146126	total: 15.3s	remaining: 9m 58s
25:	learn: 0.6121932	total: 16s	remaining: 9m 58s
26:	learn: 0.6099605	total: 16.7s	remaining: 10m 2s
27:	learn: 0.6079339	total: 17.6s	remaining: 10m 9s
28:	learn: 0.6060010	total: 18.3s	remaining: 10m 12s
29:	learn: 0.6042674	total: 19s	remaining: 10m 13s
30:	learn: 0.6026086	total: 19.7s	remaining: 10m 14s
31:	learn: 0.6009394	total: 20.3s	remaining: 10m 13s
32:	learn: 0.5998467	total: 20.8s	remaining: 10m 9s
33:	learn: 0.5986144	total: 21.3s	remaining: 10m 4s
34:	learn: 0.5972008	total: 22.1s	remaining: 10m 8s
35:	learn: 0.5959361	total: 22.6s	remaining: 10m 4s
36:	learn: 0.5942125	total: 23.3s	remaining: 10m 5s
37:	learn: 0.5927629	total: 23.9s	remaining: 10m 4s
38:	learn: 0.5914047	total: 24.5s	remaining: 10m 3s
39:	learn: 0.5902597	total: 24.9s	remaining: 9m 57s
40:	learn: 0.5889323	total: 25.5s	remaining: 9m 56s
41:	learn: 0.5879735	total: 25.9s	remaining: 9m 51s
42:	learn: 0.5872675	total: 26.5s	remaining: 9m 50s

43:	learn: 0.5860641	total: 27.2s	remaining: 9m 50s
44:	learn: 0.5852199	total: 27.8s	remaining: 9m 49s
45:	learn: 0.5843777	total: 28.2s	remaining: 9m 45s
46:	learn: 0.5834608	total: 28.9s	remaining: 9m 45s
47:	learn: 0.5823983	total: 29.8s	remaining: 9m 51s
48:	learn: 0.5814603	total: 30.4s	remaining: 9m 50s
49:	learn: 0.5809493	total: 31s	remaining: 9m 48s
50:	learn: 0.5804519	total: 31.6s	remaining: 9m 47s
51:	learn: 0.5798491	total: 32.3s	remaining: 9m 49s
52:	learn: 0.5786991	total: 33.1s	remaining: 9m 51s
53:	learn: 0.5780720	total: 34.3s	remaining: 10m 1s
54:	learn: 0.5772900	total: 35.4s	remaining: 10m 7s
55:	learn: 0.5759964	total: 36.3s	remaining: 10m 12s
56:	learn: 0.5750704	total: 37.3s	remaining: 10m 16s
57:	learn: 0.5741165	total: 38.8s	remaining: 10m 30s
58:	learn: 0.5733023	total: 39.9s	remaining: 10m 36s
59:	learn: 0.5726130	total: 40.8s	remaining: 10m 39s
60:	learn: 0.5719905	total: 41.4s	remaining: 10m 37s
61:	learn: 0.5710992	total: 42.4s	remaining: 10m 40s
62:	learn: 0.5697477	total: 44s	remaining: 10m 54s
63:	learn: 0.5692471	total: 44.5s	remaining: 10m 51s
64:	learn: 0.5684997	total: 45.6s	remaining: 10m 55s
65:	learn: 0.5680237	total: 46.1s	remaining: 10m 52s
66:	learn: 0.5668854	total: 47.1s	remaining: 10m 55s
67:	learn: 0.5664043	total: 48.4s	remaining: 11m 2s
68:	learn: 0.5658404	total: 48.9s	remaining: 11m
69:	learn: 0.5652339	total: 49.9s	remaining: 11m 2s
70:	learn: 0.5646585	total: 50.9s	remaining: 11m 5s
71:	learn: 0.5635328	total: 51.8s	remaining: 11m 8s
72:	learn: 0.5629975	total: 52.6s	remaining: 11m 8s
73:	learn: 0.5625727	total: 53.7s	remaining: 11m 11s
74:	learn: 0.5615767	total: 54.7s	remaining: 11m 14s
75:	learn: 0.5611479	total: 55.3s	remaining: 11m 12s
76:	learn: 0.5607463	total: 55.8s	remaining: 11m 9s
77:	learn: 0.5602057	total: 56.9s	remaining: 11m 12s
78:	learn: 0.5597451	total: 58.4s	remaining: 11m 20s
79:	learn: 0.5592532	total: 59.1s	remaining: 11m 19s
80:	learn: 0.5584603	total: 1m 1s	remaining: 11m 33s
81:	learn: 0.5580190	total: 1m 2s	remaining: 11m 34s
82:	learn: 0.5573199	total: 1m 4s	remaining: 11m 48s
83:	learn: 0.5566328	total: 1m 6s	remaining: 12m
84:	learn: 0.5556858	total: 1m 7s	remaining: 12m 11s
85:	learn: 0.5547898	total: 1m 10s	remaining: 12m 33s

86:	learn: 0.5540779	total: 1m 13s	remaining: 12m 48s
87:	learn: 0.5531873	total: 1m 15s	remaining: 13m 3s
88:	learn: 0.5523157	total: 1m 17s	remaining: 13m 17s
89:	learn: 0.5515634	total: 1m 20s	remaining: 13m 31s
90:	learn: 0.5508703	total: 1m 22s	remaining: 13m 48s
91:	learn: 0.5504240	total: 1m 23s	remaining: 13m 45s
92:	learn: 0.5497262	total: 1m 26s	remaining: 14m 2s
93:	learn: 0.5491468	total: 1m 28s	remaining: 14m 13s
94:	learn: 0.5484954	total: 1m 29s	remaining: 14m 11s
95:	learn: 0.5477270	total: 1m 31s	remaining: 14m 25s
96:	learn: 0.5472522	total: 1m 32s	remaining: 14m 21s
97:	learn: 0.5466538	total: 1m 35s	remaining: 14m 39s
98:	learn: 0.5460816	total: 1m 38s	remaining: 14m 54s
99:	learn: 0.5451447	total: 1m 40s	remaining: 15m 6s
100:	learn: 0.5442083	total: 1m 42s	remaining: 15m 8s
101:	learn: 0.5437103	total: 1m 43s	remaining: 15m 11s
102:	learn: 0.5430902	total: 1m 45s	remaining: 15m 21s
103:	learn: 0.5422505	total: 1m 47s	remaining: 15m 23s
104:	learn: 0.5414519	total: 1m 48s	remaining: 15m 29s
105:	learn: 0.5406969	total: 1m 50s	remaining: 15m 32s
106:	learn: 0.5403002	total: 1m 52s	remaining: 15m 38s
107:	learn: 0.5398598	total: 1m 53s	remaining: 15m 34s
108:	learn: 0.5391747	total: 1m 55s	remaining: 15m 43s
109:	learn: 0.5388879	total: 1m 56s	remaining: 15m 44s
110:	learn: 0.5384903	total: 1m 57s	remaining: 15m 44s
111:	learn: 0.5378375	total: 1m 59s	remaining: 15m 51s
112:	learn: 0.5372448	total: 2m 1s	remaining: 15m 52s
113:	learn: 0.5368993	total: 2m 2s	remaining: 15m 52s
114:	learn: 0.5362885	total: 2m 4s	remaining: 15m 57s
115:	learn: 0.5358041	total: 2m 5s	remaining: 15m 57s
116:	learn: 0.5354572	total: 2m 6s	remaining: 15m 53s
117:	learn: 0.5351729	total: 2m 7s	remaining: 15m 51s
118:	learn: 0.5348380	total: 2m 7s	remaining: 15m 46s
119:	learn: 0.5344080	total: 2m 9s	remaining: 15m 52s
120:	learn: 0.5338744	total: 2m 11s	remaining: 15m 58s
121:	learn: 0.5334143	total: 2m 13s	remaining: 15m 59s
122:	learn: 0.5329415	total: 2m 14s	remaining: 15m 59s
123:	learn: 0.5325929	total: 2m 15s	remaining: 16m
124:	learn: 0.5322312	total: 2m 17s	remaining: 16m 4s
125:	learn: 0.5320008	total: 2m 18s	remaining: 16m 2s
126:	learn: 0.5316594	total: 2m 20s	remaining: 16m 8s
127:	learn: 0.5314276	total: 2m 21s	remaining: 16m 5s
128:	learn: 0.5310299	total: 2m 22s	remaining: 16m 5s

129:	learn: 0.5307085	total: 2m 24s	remaining: 16m 6s
130:	learn: 0.5302040	total: 2m 27s	remaining: 16m 21s
131:	learn: 0.5298502	total: 2m 29s	remaining: 16m 26s
132:	learn: 0.5295380	total: 2m 31s	remaining: 16m 25s
133:	learn: 0.5293620	total: 2m 32s	remaining: 16m 23s
134:	learn: 0.5290306	total: 2m 34s	remaining: 16m 29s
135:	learn: 0.5287523	total: 2m 36s	remaining: 16m 32s
136:	learn: 0.5283328	total: 2m 38s	remaining: 16m 38s
137:	learn: 0.5280577	total: 2m 39s	remaining: 16m 35s
138:	learn: 0.5277642	total: 2m 40s	remaining: 16m 34s
139:	learn: 0.5271728	total: 2m 42s	remaining: 16m 38s
140:	learn: 0.5269137	total: 2m 44s	remaining: 16m 43s
141:	learn: 0.5263898	total: 2m 48s	remaining: 16m 56s
142:	learn: 0.5259933	total: 2m 48s	remaining: 16m 52s
143:	learn: 0.5257517	total: 2m 51s	remaining: 16m 57s
144:	learn: 0.5255529	total: 2m 52s	remaining: 16m 54s
145:	learn: 0.5251831	total: 2m 54s	remaining: 16m 59s
146:	learn: 0.5247035	total: 2m 57s	remaining: 17m 8s
147:	learn: 0.5241865	total: 2m 58s	remaining: 17m 10s
148:	learn: 0.5237373	total: 3m 2s	remaining: 17m 20s
149:	learn: 0.5234117	total: 3m 3s	remaining: 17m 20s
150:	learn: 0.5231610	total: 3m 5s	remaining: 17m 20s
151:	learn: 0.5227077	total: 3m 6s	remaining: 17m 20s
152:	learn: 0.5225146	total: 3m 7s	remaining: 17m 16s
153:	learn: 0.5221935	total: 3m 9s	remaining: 17m 20s
154:	learn: 0.5218747	total: 3m 11s	remaining: 17m 23s
155:	learn: 0.5216515	total: 3m 12s	remaining: 17m 24s
156:	learn: 0.5212994	total: 3m 13s	remaining: 17m 20s
157:	learn: 0.5209175	total: 3m 16s	remaining: 17m 27s
158:	learn: 0.5206586	total: 3m 18s	remaining: 17m 27s
159:	learn: 0.5203096	total: 3m 21s	remaining: 17m 37s
160:	learn: 0.5200769	total: 3m 22s	remaining: 17m 34s
161:	learn: 0.5198852	total: 3m 23s	remaining: 17m 30s
162:	learn: 0.5194669	total: 3m 25s	remaining: 17m 35s
163:	learn: 0.5190257	total: 3m 27s	remaining: 17m 39s
164:	learn: 0.5187706	total: 3m 29s	remaining: 17m 39s
165:	learn: 0.5184351	total: 3m 31s	remaining: 17m 43s
166:	learn: 0.5181355	total: 3m 32s	remaining: 17m 39s
167:	learn: 0.5177433	total: 3m 34s	remaining: 17m 41s
168:	learn: 0.5175382	total: 3m 36s	remaining: 17m 42s
169:	learn: 0.5171966	total: 3m 38s	remaining: 17m 46s
170:	learn: 0.5170110	total: 3m 39s	remaining: 17m 42s
171:	learn: 0.5167918	total: 3m 39s	remaining: 17m 37s

172:	learn: 0.5165399	total: 3m 41s	remaining: 17m 38s
173:	learn: 0.5162210	total: 3m 43s	remaining: 17m 42s
174:	learn: 0.5160324	total: 3m 44s	remaining: 17m 40s
175:	learn: 0.5158751	total: 3m 45s	remaining: 17m 37s
176:	learn: 0.5151063	total: 3m 48s	remaining: 17m 42s
177:	learn: 0.5148237	total: 3m 50s	remaining: 17m 46s
178:	learn: 0.5145512	total: 3m 54s	remaining: 17m 55s
179:	learn: 0.5143452	total: 3m 55s	remaining: 17m 53s
180:	learn: 0.5134929	total: 3m 58s	remaining: 18m
181:	learn: 0.5131977	total: 3m 59s	remaining: 17m 56s
182:	learn: 0.5130229	total: 4m 1s	remaining: 17m 57s
183:	learn: 0.5128572	total: 4m 2s	remaining: 17m 56s
184:	learn: 0.5119955	total: 4m 5s	remaining: 18m 2s
185:	learn: 0.5118342	total: 4m 6s	remaining: 17m 59s
186:	learn: 0.5116624	total: 4m 8s	remaining: 18m
187:	learn: 0.5114827	total: 4m 9s	remaining: 17m 57s
188:	learn: 0.5113392	total: 4m 10s	remaining: 17m 55s
189:	learn: 0.5111359	total: 4m 11s	remaining: 17m 52s
190:	learn: 0.5104140	total: 4m 14s	remaining: 17m 59s
191:	learn: 0.5097909	total: 4m 17s	remaining: 18m 1s
192:	learn: 0.5096051	total: 4m 18s	remaining: 17m 59s
193:	learn: 0.5093556	total: 4m 20s	remaining: 18m 2s
194:	learn: 0.5090725	total: 4m 21s	remaining: 17m 57s
195:	learn: 0.5089460	total: 4m 21s	remaining: 17m 54s
196:	learn: 0.5087642	total: 4m 22s	remaining: 17m 51s
197:	learn: 0.5082036	total: 4m 26s	remaining: 17m 58s
198:	learn: 0.5080396	total: 4m 27s	remaining: 17m 56s
199:	learn: 0.5078833	total: 4m 28s	remaining: 17m 52s
200:	learn: 0.5077833	total: 4m 29s	remaining: 17m 52s
201:	learn: 0.5075500	total: 4m 30s	remaining: 17m 48s
202:	learn: 0.5073556	total: 4m 32s	remaining: 17m 48s
203:	learn: 0.5071058	total: 4m 32s	remaining: 17m 44s
204:	learn: 0.5069589	total: 4m 33s	remaining: 17m 41s
205:	learn: 0.5063173	total: 4m 36s	remaining: 17m 46s
206:	learn: 0.5061490	total: 4m 38s	remaining: 17m 46s
207:	learn: 0.5059481	total: 4m 39s	remaining: 17m 44s
208:	learn: 0.5056636	total: 4m 40s	remaining: 17m 41s
209:	learn: 0.5054960	total: 4m 41s	remaining: 17m 38s
210:	learn: 0.5052153	total: 4m 43s	remaining: 17m 40s
211:	learn: 0.5050861	total: 4m 44s	remaining: 17m 37s
212:	learn: 0.5048747	total: 4m 45s	remaining: 17m 34s
213:	learn: 0.5046008	total: 4m 47s	remaining: 17m 37s
214:	learn: 0.5044239	total: 4m 51s	remaining: 17m 44s

215:	learn: 0.5041886	total: 4m 53s	remaining: 17m 46s
216:	learn: 0.5039658	total: 4m 54s	remaining: 17m 42s
217:	learn: 0.5037704	total: 4m 55s	remaining: 17m 38s
218:	learn: 0.5036097	total: 4m 55s	remaining: 17m 35s
219:	learn: 0.5033871	total: 4m 57s	remaining: 17m 36s
220:	learn: 0.5031679	total: 5m	remaining: 17m 37s
221:	learn: 0.5029857	total: 5m	remaining: 17m 34s
222:	learn: 0.5024632	total: 5m 3s	remaining: 17m 37s
223:	learn: 0.5023100	total: 5m 5s	remaining: 17m 37s
224:	learn: 0.5021953	total: 5m 6s	remaining: 17m 35s
225:	learn: 0.5020350	total: 5m 7s	remaining: 17m 31s
226:	learn: 0.5014942	total: 5m 9s	remaining: 17m 35s
227:	learn: 0.5013972	total: 5m 11s	remaining: 17m 33s
228:	learn: 0.5012858	total: 5m 11s	remaining: 17m 29s
229:	learn: 0.5011792	total: 5m 13s	remaining: 17m 29s
230:	learn: 0.5009894	total: 5m 14s	remaining: 17m 25s
231:	learn: 0.5006943	total: 5m 17s	remaining: 17m 31s
232:	learn: 0.5003936	total: 5m 18s	remaining: 17m 29s
233:	learn: 0.5003358	total: 5m 19s	remaining: 17m 26s
234:	learn: 0.5001678	total: 5m 21s	remaining: 17m 27s
235:	learn: 0.4999986	total: 5m 24s	remaining: 17m 29s
236:	learn: 0.4995124	total: 5m 26s	remaining: 17m 32s
237:	learn: 0.4993539	total: 5m 28s	remaining: 17m 30s
238:	learn: 0.4992038	total: 5m 28s	remaining: 17m 26s
239:	learn: 0.4988728	total: 5m 31s	remaining: 17m 29s
240:	learn: 0.4987639	total: 5m 32s	remaining: 17m 26s
241:	learn: 0.4986297	total: 5m 33s	remaining: 17m 23s
242:	learn: 0.4985454	total: 5m 34s	remaining: 17m 21s
243:	learn: 0.4984077	total: 5m 36s	remaining: 17m 22s
244:	learn: 0.4982724	total: 5m 37s	remaining: 17m 20s
245:	learn: 0.4981142	total: 5m 39s	remaining: 17m 19s
246:	learn: 0.4979236	total: 5m 40s	remaining: 17m 18s
247:	learn: 0.4978162	total: 5m 41s	remaining: 17m 15s
248:	learn: 0.4976781	total: 5m 42s	remaining: 17m 11s
249:	learn: 0.4975097	total: 5m 42s	remaining: 17m 8s
250:	learn: 0.4973896	total: 5m 43s	remaining: 17m 5s
251:	learn: 0.4973031	total: 5m 44s	remaining: 17m 2s
252:	learn: 0.4971480	total: 5m 45s	remaining: 16m 59s
253:	learn: 0.4970206	total: 5m 46s	remaining: 16m 56s
254:	learn: 0.4968661	total: 5m 48s	remaining: 16m 57s
255:	learn: 0.4964106	total: 5m 50s	remaining: 16m 59s
256:	learn: 0.4963167	total: 5m 52s	remaining: 16m 59s
257:	learn: 0.4961871	total: 5m 53s	remaining: 16m 56s

258:	learn: 0.4958330	total: 5m 55s	remaining: 16m 58s
259:	learn: 0.4956411	total: 5m 57s	remaining: 16m 56s
260:	learn: 0.4955520	total: 5m 57s	remaining: 16m 53s
261:	learn: 0.4954588	total: 5m 58s	remaining: 16m 50s
262:	learn: 0.4951956	total: 6m 2s	remaining: 16m 55s
263:	learn: 0.4950023	total: 6m 3s	remaining: 16m 52s
264:	learn: 0.4947901	total: 6m 3s	remaining: 16m 49s
265:	learn: 0.4947073	total: 6m 4s	remaining: 16m 46s
266:	learn: 0.4945507	total: 6m 5s	remaining: 16m 43s
267:	learn: 0.4944333	total: 6m 7s	remaining: 16m 44s
268:	learn: 0.4943009	total: 6m 10s	remaining: 16m 45s
269:	learn: 0.4942264	total: 6m 11s	remaining: 16m 43s
270:	learn: 0.4941180	total: 6m 13s	remaining: 16m 43s
271:	learn: 0.4940436	total: 6m 14s	remaining: 16m 41s
272:	learn: 0.4938980	total: 6m 15s	remaining: 16m 39s
273:	learn: 0.4937216	total: 6m 18s	remaining: 16m 43s
274:	learn: 0.4936048	total: 6m 19s	remaining: 16m 40s
275:	learn: 0.4934991	total: 6m 20s	remaining: 16m 37s
276:	learn: 0.4933713	total: 6m 21s	remaining: 16m 34s
277:	learn: 0.4933052	total: 6m 21s	remaining: 16m 31s
278:	learn: 0.4931773	total: 6m 23s	remaining: 16m 30s
279:	learn: 0.4930181	total: 6m 24s	remaining: 16m 27s
280:	learn: 0.4928560	total: 6m 24s	remaining: 16m 24s
281:	learn: 0.4927424	total: 6m 25s	remaining: 16m 21s
282:	learn: 0.4926757	total: 6m 26s	remaining: 16m 18s
283:	learn: 0.4924674	total: 6m 27s	remaining: 16m 16s
284:	learn: 0.4923936	total: 6m 28s	remaining: 16m 13s
285:	learn: 0.4921968	total: 6m 31s	remaining: 16m 18s
286:	learn: 0.4921013	total: 6m 32s	remaining: 16m 14s
287:	learn: 0.4920524	total: 6m 33s	remaining: 16m 12s
288:	learn: 0.4919411	total: 6m 34s	remaining: 16m 10s
289:	learn: 0.4918418	total: 6m 35s	remaining: 16m 9s
290:	learn: 0.4916470	total: 6m 36s	remaining: 16m 6s
291:	learn: 0.4913877	total: 6m 39s	remaining: 16m 7s
292:	learn: 0.4912959	total: 6m 41s	remaining: 16m 8s
293:	learn: 0.4912039	total: 6m 42s	remaining: 16m 7s
294:	learn: 0.4910610	total: 6m 43s	remaining: 16m 5s
295:	learn: 0.4908776	total: 6m 47s	remaining: 16m 8s
296:	learn: 0.4907602	total: 6m 48s	remaining: 16m 6s
297:	learn: 0.4906443	total: 6m 49s	remaining: 16m 4s
298:	learn: 0.4905659	total: 6m 50s	remaining: 16m 1s
299:	learn: 0.4904212	total: 6m 50s	remaining: 15m 58s
300:	learn: 0.4903334	total: 6m 51s	remaining: 15m 56s

301:	learn: 0.4902642	total: 6m 53s	remaining: 15m 56s
302:	learn: 0.4901475	total: 6m 54s	remaining: 15m 54s
303:	learn: 0.4900695	total: 6m 55s	remaining: 15m 51s
304:	learn: 0.4897610	total: 6m 58s	remaining: 15m 54s
305:	learn: 0.4895703	total: 6m 59s	remaining: 15m 52s
306:	learn: 0.4894898	total: 7m 1s	remaining: 15m 51s
307:	learn: 0.4894061	total: 7m 3s	remaining: 15m 50s
308:	learn: 0.4893348	total: 7m 4s	remaining: 15m 48s
309:	learn: 0.4892373	total: 7m 5s	remaining: 15m 47s
310:	learn: 0.4890564	total: 7m 6s	remaining: 15m 44s
311:	learn: 0.4889400	total: 7m 7s	remaining: 15m 42s
312:	learn: 0.4888735	total: 7m 8s	remaining: 15m 40s
313:	learn: 0.4887675	total: 7m 9s	remaining: 15m 37s
314:	learn: 0.4886831	total: 7m 11s	remaining: 15m 37s
315:	learn: 0.4884474	total: 7m 14s	remaining: 15m 39s
316:	learn: 0.4883524	total: 7m 14s	remaining: 15m 36s
317:	learn: 0.4881406	total: 7m 16s	remaining: 15m 37s
318:	learn: 0.4880653	total: 7m 17s	remaining: 15m 34s
319:	learn: 0.4880191	total: 7m 18s	remaining: 15m 32s
320:	learn: 0.4879386	total: 7m 20s	remaining: 15m 30s
321:	learn: 0.4878729	total: 7m 21s	remaining: 15m 28s
322:	learn: 0.4877940	total: 7m 22s	remaining: 15m 26s
323:	learn: 0.4877511	total: 7m 23s	remaining: 15m 25s
324:	learn: 0.4876629	total: 7m 24s	remaining: 15m 22s
325:	learn: 0.4875124	total: 7m 27s	remaining: 15m 24s
326:	learn: 0.4874640	total: 7m 28s	remaining: 15m 23s
327:	learn: 0.4873343	total: 7m 29s	remaining: 15m 20s
328:	learn: 0.4872868	total: 7m 31s	remaining: 15m 19s
329:	learn: 0.4871484	total: 7m 31s	remaining: 15m 17s
330:	learn: 0.4870464	total: 7m 33s	remaining: 15m 15s
331:	learn: 0.4869565	total: 7m 34s	remaining: 15m 13s
332:	learn: 0.4869133	total: 7m 35s	remaining: 15m 12s
333:	learn: 0.4868455	total: 7m 36s	remaining: 15m 9s
334:	learn: 0.4867775	total: 7m 37s	remaining: 15m 8s
335:	learn: 0.4866913	total: 7m 38s	remaining: 15m 5s
336:	learn: 0.4865941	total: 7m 39s	remaining: 15m 4s
337:	learn: 0.4863806	total: 7m 41s	remaining: 15m 4s
338:	learn: 0.4862906	total: 7m 42s	remaining: 15m 2s
339:	learn: 0.4861985	total: 7m 43s	remaining: 15m
340:	learn: 0.4858898	total: 7m 46s	remaining: 15m 1s
341:	learn: 0.4858189	total: 7m 48s	remaining: 15m
342:	learn: 0.4856864	total: 7m 49s	remaining: 14m 58s
343:	learn: 0.4855899	total: 7m 50s	remaining: 14m 57s

344:	learn: 0.4854087	total: 7m 52s	remaining: 14m 57s
345:	learn: 0.4853384	total: 7m 54s	remaining: 14m 57s
346:	learn: 0.4851906	total: 7m 55s	remaining: 14m 54s
347:	learn: 0.4850688	total: 7m 56s	remaining: 14m 52s
348:	learn: 0.4849914	total: 7m 56s	remaining: 14m 49s
349:	learn: 0.4848998	total: 7m 57s	remaining: 14m 47s
350:	learn: 0.4847800	total: 7m 58s	remaining: 14m 44s
351:	learn: 0.4847087	total: 7m 59s	remaining: 14m 42s
352:	learn: 0.4846059	total: 7m 59s	remaining: 14m 39s
353:	learn: 0.4845269	total: 8m	remaining: 14m 37s
354:	learn: 0.4844884	total: 8m 2s	remaining: 14m 36s
355:	learn: 0.4844024	total: 8m 3s	remaining: 14m 33s
356:	learn: 0.4841141	total: 8m 5s	remaining: 14m 34s
357:	learn: 0.4839931	total: 8m 6s	remaining: 14m 32s
358:	learn: 0.4838044	total: 8m 10s	remaining: 14m 35s
359:	learn: 0.4837594	total: 8m 11s	remaining: 14m 33s
360:	learn: 0.4837118	total: 8m 12s	remaining: 14m 32s
361:	learn: 0.4836596	total: 8m 14s	remaining: 14m 32s
362:	learn: 0.4836115	total: 8m 15s	remaining: 14m 30s
363:	learn: 0.4835623	total: 8m 16s	remaining: 14m 27s
364:	learn: 0.4834888	total: 8m 17s	remaining: 14m 25s
365:	learn: 0.4833245	total: 8m 18s	remaining: 14m 23s
366:	learn: 0.4832476	total: 8m 19s	remaining: 14m 20s
367:	learn: 0.4831600	total: 8m 19s	remaining: 14m 18s
368:	learn: 0.4830820	total: 8m 20s	remaining: 14m 16s
369:	learn: 0.4829398	total: 8m 24s	remaining: 14m 18s
370:	learn: 0.4829026	total: 8m 26s	remaining: 14m 18s
371:	learn: 0.4828550	total: 8m 27s	remaining: 14m 16s
372:	learn: 0.4827023	total: 8m 29s	remaining: 14m 16s
373:	learn: 0.4826575	total: 8m 30s	remaining: 14m 15s
374:	learn: 0.4825750	total: 8m 31s	remaining: 14m 13s
375:	learn: 0.4823445	total: 8m 34s	remaining: 14m 14s
376:	learn: 0.4822995	total: 8m 35s	remaining: 14m 12s
377:	learn: 0.4822306	total: 8m 36s	remaining: 14m 10s
378:	learn: 0.4821833	total: 8m 37s	remaining: 14m 7s
379:	learn: 0.4821202	total: 8m 38s	remaining: 14m 5s
380:	learn: 0.4820483	total: 8m 39s	remaining: 14m 3s
381:	learn: 0.4819376	total: 8m 40s	remaining: 14m 1s
382:	learn: 0.4817915	total: 8m 41s	remaining: 14m
383:	learn: 0.4817253	total: 8m 42s	remaining: 13m 57s
384:	learn: 0.4816786	total: 8m 43s	remaining: 13m 55s
385:	learn: 0.4815792	total: 8m 44s	remaining: 13m 53s
386:	learn: 0.4815299	total: 8m 45s	remaining: 13m 52s

387:	learn: 0.4814443	total: 8m 46s	remaining: 13m 50s
388:	learn: 0.4813853	total: 8m 47s	remaining: 13m 47s
389:	learn: 0.4813600	total: 8m 47s	remaining: 13m 45s
390:	learn: 0.4813091	total: 8m 49s	remaining: 13m 45s
391:	learn: 0.4812549	total: 8m 50s	remaining: 13m 43s
392:	learn: 0.4811845	total: 8m 51s	remaining: 13m 41s
393:	learn: 0.4811663	total: 8m 52s	remaining: 13m 38s
394:	learn: 0.4811015	total: 8m 53s	remaining: 13m 36s
395:	learn: 0.4810038	total: 8m 53s	remaining: 13m 34s
396:	learn: 0.4809454	total: 8m 54s	remaining: 13m 32s
397:	learn: 0.4809148	total: 8m 55s	remaining: 13m 30s
398:	learn: 0.4808213	total: 8m 57s	remaining: 13m 29s
399:	learn: 0.4805674	total: 8m 59s	remaining: 13m 29s
400:	learn: 0.4805046	total: 9m	remaining: 13m 27s
401:	learn: 0.4804571	total: 9m 1s	remaining: 13m 25s
402:	learn: 0.4803301	total: 9m 2s	remaining: 13m 23s
403:	learn: 0.4802735	total: 9m 3s	remaining: 13m 21s
404:	learn: 0.4802303	total: 9m 4s	remaining: 13m 20s
405:	learn: 0.4801840	total: 9m 5s	remaining: 13m 18s
406:	learn: 0.4801157	total: 9m 6s	remaining: 13m 16s
407:	learn: 0.4800574	total: 9m 7s	remaining: 13m 13s
408:	learn: 0.4799523	total: 9m 8s	remaining: 13m 12s
409:	learn: 0.4799168	total: 9m 9s	remaining: 13m 10s
410:	learn: 0.4797683	total: 9m 11s	remaining: 13m 10s
411:	learn: 0.4796381	total: 9m 13s	remaining: 13m 10s
412:	learn: 0.4795746	total: 9m 14s	remaining: 13m 8s
413:	learn: 0.4795276	total: 9m 15s	remaining: 13m 6s
414:	learn: 0.4793123	total: 9m 17s	remaining: 13m 6s
415:	learn: 0.4791615	total: 9m 20s	remaining: 13m 7s
416:	learn: 0.4790695	total: 9m 22s	remaining: 13m 5s
417:	learn: 0.4790293	total: 9m 23s	remaining: 13m 4s
418:	learn: 0.4789024	total: 9m 25s	remaining: 13m 3s
419:	learn: 0.4788354	total: 9m 26s	remaining: 13m 1s
420:	learn: 0.4787125	total: 9m 26s	remaining: 12m 59s
421:	learn: 0.4786149	total: 9m 27s	remaining: 12m 57s
422:	learn: 0.4785877	total: 9m 28s	remaining: 12m 55s
423:	learn: 0.4785492	total: 9m 30s	remaining: 12m 54s
424:	learn: 0.4784718	total: 9m 30s	remaining: 12m 52s
425:	learn: 0.4784451	total: 9m 31s	remaining: 12m 50s
426:	learn: 0.4783971	total: 9m 32s	remaining: 12m 48s
427:	learn: 0.4783334	total: 9m 35s	remaining: 12m 49s
428:	learn: 0.4783001	total: 9m 36s	remaining: 12m 47s
429:	learn: 0.4781499	total: 9m 39s	remaining: 12m 48s

430:	learn: 0.4780103	total: 9m 40s	remaining: 12m 46s
431:	learn: 0.4779123	total: 9m 41s	remaining: 12m 44s
432:	learn: 0.4778174	total: 9m 42s	remaining: 12m 42s
433:	learn: 0.4777643	total: 9m 44s	remaining: 12m 42s
434:	learn: 0.4777217	total: 9m 45s	remaining: 12m 40s
435:	learn: 0.4776421	total: 9m 46s	remaining: 12m 39s
436:	learn: 0.4775597	total: 9m 47s	remaining: 12m 37s
437:	learn: 0.4774330	total: 9m 50s	remaining: 12m 37s
438:	learn: 0.4773724	total: 9m 51s	remaining: 12m 35s
439:	learn: 0.4773330	total: 9m 52s	remaining: 12m 34s
440:	learn: 0.4772346	total: 9m 53s	remaining: 12m 31s
441:	learn: 0.4771336	total: 9m 53s	remaining: 12m 29s
442:	learn: 0.4770381	total: 9m 54s	remaining: 12m 27s
443:	learn: 0.4769214	total: 9m 55s	remaining: 12m 25s
444:	learn: 0.4768706	total: 9m 56s	remaining: 12m 24s
445:	learn: 0.4767987	total: 9m 58s	remaining: 12m 23s
446:	learn: 0.4767497	total: 9m 59s	remaining: 12m 21s
447:	learn: 0.4766662	total: 10m	remaining: 12m 19s
448:	learn: 0.4765963	total: 10m 1s	remaining: 12m 17s
449:	learn: 0.4765651	total: 10m 2s	remaining: 12m 15s
450:	learn: 0.4765299	total: 10m 2s	remaining: 12m 13s
451:	learn: 0.4764799	total: 10m 5s	remaining: 12m 13s
452:	learn: 0.4763971	total: 10m 6s	remaining: 12m 12s
453:	learn: 0.4763589	total: 10m 7s	remaining: 12m 10s
454:	learn: 0.4763114	total: 10m 9s	remaining: 12m 10s
455:	learn: 0.4762636	total: 10m 11s	remaining: 12m 9s
456:	learn: 0.4761494	total: 10m 13s	remaining: 12m 8s
457:	learn: 0.4761044	total: 10m 14s	remaining: 12m 6s
458:	learn: 0.4760364	total: 10m 15s	remaining: 12m 5s
459:	learn: 0.4759572	total: 10m 16s	remaining: 12m 3s
460:	learn: 0.4759016	total: 10m 16s	remaining: 12m 1s
461:	learn: 0.4758436	total: 10m 17s	remaining: 11m 59s
462:	learn: 0.4758061	total: 10m 18s	remaining: 11m 57s
463:	learn: 0.4757383	total: 10m 19s	remaining: 11m 56s
464:	learn: 0.4757016	total: 10m 20s	remaining: 11m 54s
465:	learn: 0.4756582	total: 10m 23s	remaining: 11m 54s
466:	learn: 0.4755845	total: 10m 24s	remaining: 11m 52s
467:	learn: 0.4755090	total: 10m 25s	remaining: 11m 50s
468:	learn: 0.4754470	total: 10m 26s	remaining: 11m 48s
469:	learn: 0.4753722	total: 10m 27s	remaining: 11m 47s
470:	learn: 0.4752721	total: 10m 28s	remaining: 11m 45s
471:	learn: 0.4752348	total: 10m 28s	remaining: 11m 43s
472:	learn: 0.4751394	total: 10m 29s	remaining: 11m 41s

473:	learn: 0.4750872	total: 10m 31s	remaining: 11m 41s
474:	learn: 0.4750123	total: 10m 33s	remaining: 11m 39s
475:	learn: 0.4749245	total: 10m 34s	remaining: 11m 37s
476:	learn: 0.4748560	total: 10m 35s	remaining: 11m 36s
477:	learn: 0.4747837	total: 10m 36s	remaining: 11m 34s
478:	learn: 0.4746462	total: 10m 39s	remaining: 11m 35s
479:	learn: 0.4745419	total: 10m 40s	remaining: 11m 34s
480:	learn: 0.4744745	total: 10m 41s	remaining: 11m 32s
481:	learn: 0.4744019	total: 10m 42s	remaining: 11m 30s
482:	learn: 0.4742960	total: 10m 43s	remaining: 11m 28s
483:	learn: 0.4742588	total: 10m 44s	remaining: 11m 26s
484:	learn: 0.4742021	total: 10m 45s	remaining: 11m 25s
485:	learn: 0.4741519	total: 10m 47s	remaining: 11m 25s
486:	learn: 0.4741093	total: 10m 48s	remaining: 11m 23s
487:	learn: 0.4740703	total: 10m 51s	remaining: 11m 23s
488:	learn: 0.4739287	total: 10m 53s	remaining: 11m 23s
489:	learn: 0.4738908	total: 10m 56s	remaining: 11m 23s
490:	learn: 0.4738609	total: 10m 57s	remaining: 11m 21s
491:	learn: 0.4737002	total: 10m 58s	remaining: 11m 19s
492:	learn: 0.4736148	total: 10m 59s	remaining: 11m 17s
493:	learn: 0.4735665	total: 11m	remaining: 11m 16s
494:	learn: 0.4735239	total: 11m	remaining: 11m 14s
495:	learn: 0.4734621	total: 11m 1s	remaining: 11m 12s
496:	learn: 0.4733789	total: 11m 2s	remaining: 11m 10s
497:	learn: 0.4732727	total: 11m 5s	remaining: 11m 10s
498:	learn: 0.4732369	total: 11m 7s	remaining: 11m 10s
499:	learn: 0.4731909	total: 11m 8s	remaining: 11m 8s
500:	learn: 0.4731200	total: 11m 9s	remaining: 11m 6s
501:	learn: 0.4730398	total: 11m 10s	remaining: 11m 5s
502:	learn: 0.4729867	total: 11m 11s	remaining: 11m 3s
503:	learn: 0.4729231	total: 11m 12s	remaining: 11m 1s
504:	learn: 0.4728760	total: 11m 13s	remaining: 11m
505:	learn: 0.4728123	total: 11m 14s	remaining: 10m 58s
506:	learn: 0.4727218	total: 11m 14s	remaining: 10m 56s
507:	learn: 0.4726780	total: 11m 15s	remaining: 10m 54s
508:	learn: 0.4726373	total: 11m 16s	remaining: 10m 52s
509:	learn: 0.4725985	total: 11m 18s	remaining: 10m 51s
510:	learn: 0.4724857	total: 11m 20s	remaining: 10m 51s
511:	learn: 0.4724057	total: 11m 21s	remaining: 10m 49s
512:	learn: 0.4723681	total: 11m 22s	remaining: 10m 48s
513:	learn: 0.4723404	total: 11m 24s	remaining: 10m 47s
514:	learn: 0.4722970	total: 11m 26s	remaining: 10m 46s
515:	learn: 0.4722214	total: 11m 27s	remaining: 10m 44s

516:	learn: 0.4720421	total: 11m 29s	remaining: 10m 44s
517:	learn: 0.4719821	total: 11m 30s	remaining: 10m 42s
518:	learn: 0.4719280	total: 11m 31s	remaining: 10m 40s
519:	learn: 0.4718873	total: 11m 32s	remaining: 10m 38s
520:	learn: 0.4718439	total: 11m 33s	remaining: 10m 37s
521:	learn: 0.4717970	total: 11m 33s	remaining: 10m 35s
522:	learn: 0.4717085	total: 11m 34s	remaining: 10m 33s
523:	learn: 0.4716867	total: 11m 35s	remaining: 10m 31s
524:	learn: 0.4716041	total: 11m 35s	remaining: 10m 29s
525:	learn: 0.4715543	total: 11m 38s	remaining: 10m 29s
526:	learn: 0.4714778	total: 11m 39s	remaining: 10m 27s
527:	learn: 0.4714165	total: 11m 40s	remaining: 10m 25s
528:	learn: 0.4713063	total: 11m 42s	remaining: 10m 25s
529:	learn: 0.4712644	total: 11m 44s	remaining: 10m 25s
530:	learn: 0.4712264	total: 11m 45s	remaining: 10m 23s
531:	learn: 0.4711668	total: 11m 46s	remaining: 10m 21s
532:	learn: 0.4711088	total: 11m 47s	remaining: 10m 19s
533:	learn: 0.4710490	total: 11m 48s	remaining: 10m 18s
534:	learn: 0.4709653	total: 11m 49s	remaining: 10m 16s
535:	learn: 0.4709191	total: 11m 51s	remaining: 10m 15s
536:	learn: 0.4708795	total: 11m 51s	remaining: 10m 13s
537:	learn: 0.4708086	total: 11m 52s	remaining: 10m 11s
538:	learn: 0.4707110	total: 11m 54s	remaining: 10m 11s
539:	learn: 0.4706625	total: 11m 55s	remaining: 10m 9s
540:	learn: 0.4705977	total: 11m 57s	remaining: 10m 8s
541:	learn: 0.4705721	total: 11m 58s	remaining: 10m 7s
542:	learn: 0.4705037	total: 11m 59s	remaining: 10m 5s
543:	learn: 0.4704044	total: 12m 1s	remaining: 10m 5s
544:	learn: 0.4703658	total: 12m 2s	remaining: 10m 3s
545:	learn: 0.4703188	total: 12m 3s	remaining: 10m 1s
546:	learn: 0.4702768	total: 12m 4s	remaining: 10m
547:	learn: 0.4702226	total: 12m 5s	remaining: 9m 58s
548:	learn: 0.4701587	total: 12m 7s	remaining: 9m 57s
549:	learn: 0.4701260	total: 12m 8s	remaining: 9m 55s
550:	learn: 0.4700897	total: 12m 8s	remaining: 9m 53s
551:	learn: 0.4700456	total: 12m 9s	remaining: 9m 52s
552:	learn: 0.4700080	total: 12m 10s	remaining: 9m 50s
553:	learn: 0.4699704	total: 12m 11s	remaining: 9m 49s
554:	learn: 0.4698973	total: 12m 12s	remaining: 9m 47s
555:	learn: 0.4698446	total: 12m 13s	remaining: 9m 45s
556:	learn: 0.4698061	total: 12m 14s	remaining: 9m 43s
557:	learn: 0.4697474	total: 12m 15s	remaining: 9m 42s
558:	learn: 0.4696670	total: 12m 15s	remaining: 9m 40s

559:	learn: 0.4696318	total: 12m 17s	remaining: 9m 39s
560:	learn: 0.4695825	total: 12m 18s	remaining: 9m 37s
561:	learn: 0.4695320	total: 12m 19s	remaining: 9m 36s
562:	learn: 0.4694897	total: 12m 21s	remaining: 9m 35s
563:	learn: 0.4694461	total: 12m 22s	remaining: 9m 34s
564:	learn: 0.4694035	total: 12m 23s	remaining: 9m 32s
565:	learn: 0.4693356	total: 12m 25s	remaining: 9m 31s
566:	learn: 0.4692693	total: 12m 25s	remaining: 9m 29s
567:	learn: 0.4692044	total: 12m 26s	remaining: 9m 27s
568:	learn: 0.4691562	total: 12m 27s	remaining: 9m 26s
569:	learn: 0.4691170	total: 12m 28s	remaining: 9m 24s
570:	learn: 0.4690403	total: 12m 31s	remaining: 9m 24s
571:	learn: 0.4689882	total: 12m 32s	remaining: 9m 22s
572:	learn: 0.4689250	total: 12m 32s	remaining: 9m 21s
573:	learn: 0.4688677	total: 12m 33s	remaining: 9m 19s
574:	learn: 0.4688408	total: 12m 35s	remaining: 9m 18s
575:	learn: 0.4688095	total: 12m 36s	remaining: 9m 16s
576:	learn: 0.4687363	total: 12m 36s	remaining: 9m 14s
577:	learn: 0.4686893	total: 12m 37s	remaining: 9m 13s
578:	learn: 0.4686532	total: 12m 39s	remaining: 9m 12s
579:	learn: 0.4685666	total: 12m 42s	remaining: 9m 11s
580:	learn: 0.4684728	total: 12m 44s	remaining: 9m 11s
581:	learn: 0.4684039	total: 12m 44s	remaining: 9m 9s
582:	learn: 0.4683349	total: 12m 45s	remaining: 9m 7s
583:	learn: 0.4682831	total: 12m 46s	remaining: 9m 5s
584:	learn: 0.4682229	total: 12m 47s	remaining: 9m 4s
585:	learn: 0.4681682	total: 12m 48s	remaining: 9m 2s
586:	learn: 0.4681330	total: 12m 50s	remaining: 9m 2s
587:	learn: 0.4680742	total: 12m 51s	remaining: 9m
588:	learn: 0.4680073	total: 12m 52s	remaining: 8m 59s
589:	learn: 0.4679561	total: 12m 53s	remaining: 8m 57s
590:	learn: 0.4678906	total: 12m 54s	remaining: 8m 55s
591:	learn: 0.4678025	total: 12m 56s	remaining: 8m 54s
592:	learn: 0.4677727	total: 12m 57s	remaining: 8m 53s
593:	learn: 0.4677397	total: 12m 58s	remaining: 8m 52s
594:	learn: 0.4676560	total: 13m 1s	remaining: 8m 51s
595:	learn: 0.4676153	total: 13m 2s	remaining: 8m 50s
596:	learn: 0.4675793	total: 13m 3s	remaining: 8m 48s
597:	learn: 0.4675396	total: 13m 4s	remaining: 8m 47s
598:	learn: 0.4675027	total: 13m 6s	remaining: 8m 46s
599:	learn: 0.4674509	total: 13m 6s	remaining: 8m 44s
600:	learn: 0.4673886	total: 13m 7s	remaining: 8m 42s
601:	learn: 0.4673391	total: 13m 8s	remaining: 8m 41s

602:	learn: 0.4673006	total: 13m 9s	remaining: 8m 39s
603:	learn: 0.4672380	total: 13m 11s	remaining: 8m 38s
604:	learn: 0.4671799	total: 13m 14s	remaining: 8m 38s
605:	learn: 0.4671475	total: 13m 14s	remaining: 8m 36s
606:	learn: 0.4670941	total: 13m 15s	remaining: 8m 34s
607:	learn: 0.4669523	total: 13m 17s	remaining: 8m 34s
608:	learn: 0.4669102	total: 13m 19s	remaining: 8m 33s
609:	learn: 0.4668782	total: 13m 20s	remaining: 8m 31s
610:	learn: 0.4668247	total: 13m 22s	remaining: 8m 30s
611:	learn: 0.4667658	total: 13m 23s	remaining: 8m 29s
612:	learn: 0.4667187	total: 13m 23s	remaining: 8m 27s
613:	learn: 0.4666696	total: 13m 24s	remaining: 8m 25s
614:	learn: 0.4666127	total: 13m 26s	remaining: 8m 24s
615:	learn: 0.4665619	total: 13m 27s	remaining: 8m 23s
616:	learn: 0.4665142	total: 13m 29s	remaining: 8m 22s
617:	learn: 0.4664694	total: 13m 29s	remaining: 8m 20s
618:	learn: 0.4664193	total: 13m 30s	remaining: 8m 18s
619:	learn: 0.4663732	total: 13m 33s	remaining: 8m 18s
620:	learn: 0.4663293	total: 13m 34s	remaining: 8m 16s
621:	learn: 0.4662680	total: 13m 34s	remaining: 8m 15s
622:	learn: 0.4662130	total: 13m 35s	remaining: 8m 13s
623:	learn: 0.4661638	total: 13m 37s	remaining: 8m 12s
624:	learn: 0.4661152	total: 13m 38s	remaining: 8m 11s
625:	learn: 0.4660617	total: 13m 41s	remaining: 8m 10s
626:	learn: 0.4660211	total: 13m 42s	remaining: 8m 9s
627:	learn: 0.4659844	total: 13m 43s	remaining: 8m 7s
628:	learn: 0.4659379	total: 13m 44s	remaining: 8m 6s
629:	learn: 0.4658828	total: 13m 47s	remaining: 8m 5s
630:	learn: 0.4658513	total: 13m 49s	remaining: 8m 4s
631:	learn: 0.4658096	total: 13m 50s	remaining: 8m 3s
632:	learn: 0.4657563	total: 13m 52s	remaining: 8m 2s
633:	learn: 0.4657197	total: 13m 53s	remaining: 8m 1s
634:	learn: 0.4656836	total: 13m 54s	remaining: 7m 59s
635:	learn: 0.4655484	total: 13m 58s	remaining: 7m 59s
636:	learn: 0.4654749	total: 14m	remaining: 7m 58s
637:	learn: 0.4654264	total: 14m 2s	remaining: 7m 58s
638:	learn: 0.4653773	total: 14m 3s	remaining: 7m 56s
639:	learn: 0.4653274	total: 14m 4s	remaining: 7m 54s
640:	learn: 0.4652728	total: 14m 5s	remaining: 7m 53s
641:	learn: 0.4652296	total: 14m 6s	remaining: 7m 52s
642:	learn: 0.4651500	total: 14m 8s	remaining: 7m 51s
643:	learn: 0.4651094	total: 14m 10s	remaining: 7m 50s
644:	learn: 0.4650593	total: 14m 11s	remaining: 7m 48s

645:	learn: 0.4650125	total: 14m 11s	remaining: 7m 46s
646:	learn: 0.4649643	total: 14m 12s	remaining: 7m 44s
647:	learn: 0.4649373	total: 14m 13s	remaining: 7m 43s
648:	learn: 0.4648629	total: 14m 14s	remaining: 7m 42s
649:	learn: 0.4648011	total: 14m 14s	remaining: 7m 40s
650:	learn: 0.4647439	total: 14m 16s	remaining: 7m 39s
651:	learn: 0.4646894	total: 14m 16s	remaining: 7m 37s
652:	learn: 0.4646490	total: 14m 17s	remaining: 7m 35s
653:	learn: 0.4645962	total: 14m 18s	remaining: 7m 34s
654:	learn: 0.4645447	total: 14m 19s	remaining: 7m 32s
655:	learn: 0.4645070	total: 14m 19s	remaining: 7m 30s
656:	learn: 0.4643708	total: 14m 21s	remaining: 7m 29s
657:	learn: 0.4643211	total: 14m 21s	remaining: 7m 27s
658:	learn: 0.4642747	total: 14m 24s	remaining: 7m 27s
659:	learn: 0.4642504	total: 14m 24s	remaining: 7m 25s
660:	learn: 0.4642140	total: 14m 25s	remaining: 7m 24s
661:	learn: 0.4641822	total: 14m 26s	remaining: 7m 22s
662:	learn: 0.4641420	total: 14m 27s	remaining: 7m 20s
663:	learn: 0.4641019	total: 14m 30s	remaining: 7m 20s
664:	learn: 0.4640806	total: 14m 32s	remaining: 7m 19s
665:	learn: 0.4640331	total: 14m 32s	remaining: 7m 17s
666:	learn: 0.4639810	total: 14m 33s	remaining: 7m 16s
667:	learn: 0.4638589	total: 14m 35s	remaining: 7m 15s
668:	learn: 0.4638161	total: 14m 36s	remaining: 7m 13s
669:	learn: 0.4637570	total: 14m 38s	remaining: 7m 12s
670:	learn: 0.4637192	total: 14m 39s	remaining: 7m 11s
671:	learn: 0.4636824	total: 14m 40s	remaining: 7m 9s
672:	learn: 0.4636454	total: 14m 41s	remaining: 7m 8s
673:	learn: 0.4635934	total: 14m 42s	remaining: 7m 6s
674:	learn: 0.4635173	total: 14m 43s	remaining: 7m 5s
675:	learn: 0.4634859	total: 14m 45s	remaining: 7m 4s
676:	learn: 0.4633578	total: 14m 46s	remaining: 7m 3s
677:	learn: 0.4633014	total: 14m 47s	remaining: 7m 1s
678:	learn: 0.4632619	total: 14m 48s	remaining: 6m 59s
679:	learn: 0.4632102	total: 14m 48s	remaining: 6m 58s
680:	learn: 0.4631566	total: 14m 50s	remaining: 6m 57s
681:	learn: 0.4631131	total: 14m 51s	remaining: 6m 55s
682:	learn: 0.4630860	total: 14m 52s	remaining: 6m 54s
683:	learn: 0.4630419	total: 14m 52s	remaining: 6m 52s
684:	learn: 0.4629935	total: 14m 53s	remaining: 6m 50s
685:	learn: 0.4628688	total: 14m 55s	remaining: 6m 49s
686:	learn: 0.4628286	total: 14m 56s	remaining: 6m 48s
687:	learn: 0.4627481	total: 14m 58s	remaining: 6m 47s

688:	learn: 0.4627111	total: 15m 1s	remaining: 6m 46s
689:	learn: 0.4626675	total: 15m 1s	remaining: 6m 45s
690:	learn: 0.4626269	total: 15m 2s	remaining: 6m 43s
691:	learn: 0.4625674	total: 15m 3s	remaining: 6m 42s
692:	learn: 0.4625137	total: 15m 4s	remaining: 6m 40s
693:	learn: 0.4624173	total: 15m 5s	remaining: 6m 39s
694:	learn: 0.4623830	total: 15m 6s	remaining: 6m 37s
695:	learn: 0.4623421	total: 15m 7s	remaining: 6m 36s
696:	learn: 0.4622514	total: 15m 8s	remaining: 6m 35s
697:	learn: 0.4621968	total: 15m 9s	remaining: 6m 33s
698:	learn: 0.4621709	total: 15m 11s	remaining: 6m 32s
699:	learn: 0.4621106	total: 15m 12s	remaining: 6m 31s
700:	learn: 0.4620849	total: 15m 14s	remaining: 6m 29s
701:	learn: 0.4620421	total: 15m 15s	remaining: 6m 28s
702:	learn: 0.4619291	total: 15m 17s	remaining: 6m 27s
703:	learn: 0.4618917	total: 15m 17s	remaining: 6m 25s
704:	learn: 0.4618554	total: 15m 18s	remaining: 6m 24s
705:	learn: 0.4618141	total: 15m 19s	remaining: 6m 22s
706:	learn: 0.4617830	total: 15m 20s	remaining: 6m 21s
707:	learn: 0.4617466	total: 15m 21s	remaining: 6m 20s
708:	learn: 0.4616948	total: 15m 22s	remaining: 6m 18s
709:	learn: 0.4616684	total: 15m 22s	remaining: 6m 16s
710:	learn: 0.4616271	total: 15m 24s	remaining: 6m 15s
711:	learn: 0.4615384	total: 15m 25s	remaining: 6m 14s
712:	learn: 0.4615114	total: 15m 26s	remaining: 6m 13s
713:	learn: 0.4614907	total: 15m 27s	remaining: 6m 11s
714:	learn: 0.4614612	total: 15m 28s	remaining: 6m 10s
715:	learn: 0.4614246	total: 15m 29s	remaining: 6m 8s
716:	learn: 0.4613183	total: 15m 31s	remaining: 6m 7s
717:	learn: 0.4612751	total: 15m 32s	remaining: 6m 6s
718:	learn: 0.4612342	total: 15m 32s	remaining: 6m 4s
719:	learn: 0.4612016	total: 15m 33s	remaining: 6m 3s
720:	learn: 0.4611559	total: 15m 34s	remaining: 6m 1s
721:	learn: 0.4611127	total: 15m 35s	remaining: 6m
722:	learn: 0.4610714	total: 15m 36s	remaining: 5m 58s
723:	learn: 0.4610429	total: 15m 37s	remaining: 5m 57s
724:	learn: 0.4610154	total: 15m 38s	remaining: 5m 56s
725:	learn: 0.4609863	total: 15m 39s	remaining: 5m 54s
726:	learn: 0.4609640	total: 15m 40s	remaining: 5m 53s
727:	learn: 0.4609396	total: 15m 41s	remaining: 5m 51s
728:	learn: 0.4608993	total: 15m 42s	remaining: 5m 50s
729:	learn: 0.4608646	total: 15m 43s	remaining: 5m 48s
730:	learn: 0.4608457	total: 15m 43s	remaining: 5m 47s

731:	learn: 0.4608108	total: 15m 46s	remaining: 5m 46s
732:	learn: 0.4607757	total: 15m 48s	remaining: 5m 45s
733:	learn: 0.4607235	total: 15m 50s	remaining: 5m 44s
734:	learn: 0.4606747	total: 15m 51s	remaining: 5m 43s
735:	learn: 0.4606538	total: 15m 52s	remaining: 5m 41s
736:	learn: 0.4606287	total: 15m 53s	remaining: 5m 40s
737:	learn: 0.4605736	total: 15m 53s	remaining: 5m 38s
738:	learn: 0.4605426	total: 15m 54s	remaining: 5m 37s
739:	learn: 0.4604364	total: 15m 56s	remaining: 5m 36s
740:	learn: 0.4604065	total: 15m 57s	remaining: 5m 34s
741:	learn: 0.4603679	total: 15m 58s	remaining: 5m 33s
742:	learn: 0.4603253	total: 15m 59s	remaining: 5m 31s
743:	learn: 0.4602614	total: 15m 59s	remaining: 5m 30s
744:	learn: 0.4602292	total: 16m	remaining: 5m 28s
745:	learn: 0.4601916	total: 16m 2s	remaining: 5m 27s
746:	learn: 0.4601600	total: 16m 2s	remaining: 5m 26s
747:	learn: 0.4600513	total: 16m 5s	remaining: 5m 25s
748:	learn: 0.4599710	total: 16m 6s	remaining: 5m 23s
749:	learn: 0.4599342	total: 16m 6s	remaining: 5m 22s
750:	learn: 0.4599016	total: 16m 7s	remaining: 5m 20s
751:	learn: 0.4598650	total: 16m 8s	remaining: 5m 19s
752:	learn: 0.4598173	total: 16m 9s	remaining: 5m 17s
753:	learn: 0.4597810	total: 16m 9s	remaining: 5m 16s
754:	learn: 0.4597440	total: 16m 10s	remaining: 5m 14s
755:	learn: 0.4596677	total: 16m 13s	remaining: 5m 14s
756:	learn: 0.4596303	total: 16m 13s	remaining: 5m 12s
757:	learn: 0.4596001	total: 16m 14s	remaining: 5m 11s
758:	learn: 0.4595700	total: 16m 15s	remaining: 5m 9s
759:	learn: 0.4595339	total: 16m 15s	remaining: 5m 8s
760:	learn: 0.4595127	total: 16m 16s	remaining: 5m 6s
761:	learn: 0.4594432	total: 16m 17s	remaining: 5m 5s
762:	learn: 0.4594078	total: 16m 18s	remaining: 5m 3s
763:	learn: 0.4593801	total: 16m 19s	remaining: 5m 2s
764:	learn: 0.4593479	total: 16m 22s	remaining: 5m 1s
765:	learn: 0.4593250	total: 16m 23s	remaining: 5m
766:	learn: 0.4593070	total: 16m 24s	remaining: 4m 58s
767:	learn: 0.4592420	total: 16m 24s	remaining: 4m 57s
768:	learn: 0.4592118	total: 16m 25s	remaining: 4m 56s
769:	learn: 0.4591787	total: 16m 26s	remaining: 4m 54s
770:	learn: 0.4591304	total: 16m 27s	remaining: 4m 53s
771:	learn: 0.4591003	total: 16m 28s	remaining: 4m 51s
772:	learn: 0.4590775	total: 16m 29s	remaining: 4m 50s
773:	learn: 0.4590579	total: 16m 30s	remaining: 4m 49s

774:	learn: 0.4590102	total: 16m 32s	remaining: 4m 48s
775:	learn: 0.4589878	total: 16m 33s	remaining: 4m 46s
776:	learn: 0.4589612	total: 16m 35s	remaining: 4m 45s
777:	learn: 0.4589308	total: 16m 36s	remaining: 4m 44s
778:	learn: 0.4588912	total: 16m 37s	remaining: 4m 42s
779:	learn: 0.4588244	total: 16m 39s	remaining: 4m 41s
780:	learn: 0.4587961	total: 16m 40s	remaining: 4m 40s
781:	learn: 0.4587599	total: 16m 41s	remaining: 4m 39s
782:	learn: 0.4587386	total: 16m 41s	remaining: 4m 37s
783:	learn: 0.4587047	total: 16m 43s	remaining: 4m 36s
784:	learn: 0.4586782	total: 16m 43s	remaining: 4m 34s
785:	learn: 0.4586415	total: 16m 44s	remaining: 4m 33s
786:	learn: 0.4585491	total: 16m 45s	remaining: 4m 32s
787:	learn: 0.4585142	total: 16m 47s	remaining: 4m 31s
788:	learn: 0.4584712	total: 16m 48s	remaining: 4m 29s
789:	learn: 0.4584448	total: 16m 48s	remaining: 4m 28s
790:	learn: 0.4583843	total: 16m 49s	remaining: 4m 26s
791:	learn: 0.4583514	total: 16m 52s	remaining: 4m 25s
792:	learn: 0.4583217	total: 16m 53s	remaining: 4m 24s
793:	learn: 0.4582977	total: 16m 54s	remaining: 4m 23s
794:	learn: 0.4582721	total: 16m 55s	remaining: 4m 21s
795:	learn: 0.4581926	total: 16m 56s	remaining: 4m 20s
796:	learn: 0.4581546	total: 16m 57s	remaining: 4m 19s
797:	learn: 0.4581257	total: 16m 58s	remaining: 4m 17s
798:	learn: 0.4580845	total: 16m 59s	remaining: 4m 16s
799:	learn: 0.4580612	total: 17m	remaining: 4m 15s
800:	learn: 0.4580311	total: 17m 1s	remaining: 4m 13s
801:	learn: 0.4579856	total: 17m 1s	remaining: 4m 12s
802:	learn: 0.4579659	total: 17m 2s	remaining: 4m 10s
803:	learn: 0.4579472	total: 17m 3s	remaining: 4m 9s
804:	learn: 0.4579301	total: 17m 4s	remaining: 4m 8s
805:	learn: 0.4579107	total: 17m 5s	remaining: 4m 6s
806:	learn: 0.4578788	total: 17m 5s	remaining: 4m 5s
807:	learn: 0.4578420	total: 17m 6s	remaining: 4m 3s
808:	learn: 0.4578184	total: 17m 7s	remaining: 4m 2s
809:	learn: 0.4577905	total: 17m 7s	remaining: 4m 1s
810:	learn: 0.4577694	total: 17m 8s	remaining: 3m 59s
811:	learn: 0.4577419	total: 17m 9s	remaining: 3m 58s
812:	learn: 0.4576432	total: 17m 12s	remaining: 3m 57s
813:	learn: 0.4576202	total: 17m 13s	remaining: 3m 56s
814:	learn: 0.4575837	total: 17m 14s	remaining: 3m 54s
815:	learn: 0.4575602	total: 17m 14s	remaining: 3m 53s
816:	learn: 0.4575344	total: 17m 15s	remaining: 3m 51s

817:	learn: 0.4575114	total: 17m 16s	remaining: 3m 50s
818:	learn: 0.4574577	total: 17m 18s	remaining: 3m 49s
819:	learn: 0.4574409	total: 17m 19s	remaining: 3m 48s
820:	learn: 0.4574023	total: 17m 20s	remaining: 3m 46s
821:	learn: 0.4573657	total: 17m 21s	remaining: 3m 45s
822:	learn: 0.4573344	total: 17m 22s	remaining: 3m 44s
823:	learn: 0.4573137	total: 17m 23s	remaining: 3m 42s
824:	learn: 0.4572763	total: 17m 24s	remaining: 3m 41s
825:	learn: 0.4572430	total: 17m 25s	remaining: 3m 40s
826:	learn: 0.4572252	total: 17m 27s	remaining: 3m 39s
827:	learn: 0.4571893	total: 17m 27s	remaining: 3m 37s
828:	learn: 0.4571743	total: 17m 28s	remaining: 3m 36s
829:	learn: 0.4571073	total: 17m 31s	remaining: 3m 35s
830:	learn: 0.4570567	total: 17m 32s	remaining: 3m 33s
831:	learn: 0.4570401	total: 17m 33s	remaining: 3m 32s
832:	learn: 0.4569773	total: 17m 35s	remaining: 3m 31s
833:	learn: 0.4569498	total: 17m 36s	remaining: 3m 30s
834:	learn: 0.4569209	total: 17m 37s	remaining: 3m 29s
835:	learn: 0.4568883	total: 17m 38s	remaining: 3m 27s
836:	learn: 0.4568518	total: 17m 39s	remaining: 3m 26s
837:	learn: 0.4568324	total: 17m 40s	remaining: 3m 25s
838:	learn: 0.4568078	total: 17m 41s	remaining: 3m 23s
839:	learn: 0.4567928	total: 17m 42s	remaining: 3m 22s
840:	learn: 0.4567555	total: 17m 43s	remaining: 3m 21s
841:	learn: 0.4567267	total: 17m 45s	remaining: 3m 20s
842:	learn: 0.4566981	total: 17m 47s	remaining: 3m 18s
843:	learn: 0.4566558	total: 17m 47s	remaining: 3m 17s
844:	learn: 0.4566399	total: 17m 49s	remaining: 3m 16s
845:	learn: 0.4565481	total: 17m 50s	remaining: 3m 14s
846:	learn: 0.4565116	total: 17m 50s	remaining: 3m 13s
847:	learn: 0.4564973	total: 17m 52s	remaining: 3m 12s
848:	learn: 0.4564484	total: 17m 54s	remaining: 3m 11s
849:	learn: 0.4563854	total: 17m 56s	remaining: 3m 10s
850:	learn: 0.4563538	total: 17m 57s	remaining: 3m 8s
851:	learn: 0.4563191	total: 17m 58s	remaining: 3m 7s
852:	learn: 0.4562944	total: 17m 59s	remaining: 3m 5s
853:	learn: 0.4562790	total: 18m	remaining: 3m 4s
854:	learn: 0.4562447	total: 18m 1s	remaining: 3m 3s
855:	learn: 0.4562203	total: 18m 2s	remaining: 3m 2s
856:	learn: 0.4561884	total: 18m 3s	remaining: 3m
857:	learn: 0.4561522	total: 18m 4s	remaining: 2m 59s
858:	learn: 0.4561179	total: 18m 5s	remaining: 2m 58s
859:	learn: 0.4560881	total: 18m 6s	remaining: 2m 56s

860:	learn: 0.4560718	total: 18m 7s	remaining: 2m 55s
861:	learn: 0.4560387	total: 18m 8s	remaining: 2m 54s
862:	learn: 0.4560242	total: 18m 9s	remaining: 2m 52s
863:	learn: 0.4559881	total: 18m 9s	remaining: 2m 51s
864:	learn: 0.4559725	total: 18m 10s	remaining: 2m 50s
865:	learn: 0.4559390	total: 18m 11s	remaining: 2m 48s
866:	learn: 0.4559021	total: 18m 11s	remaining: 2m 47s
867:	learn: 0.4558444	total: 18m 13s	remaining: 2m 46s
868:	learn: 0.4558094	total: 18m 14s	remaining: 2m 44s
869:	learn: 0.4557726	total: 18m 15s	remaining: 2m 43s
870:	learn: 0.4557548	total: 18m 16s	remaining: 2m 42s
871:	learn: 0.4557239	total: 18m 17s	remaining: 2m 41s
872:	learn: 0.4556776	total: 18m 18s	remaining: 2m 39s
873:	learn: 0.4556642	total: 18m 18s	remaining: 2m 38s
874:	learn: 0.4556456	total: 18m 19s	remaining: 2m 37s
875:	learn: 0.4555602	total: 18m 21s	remaining: 2m 35s
876:	learn: 0.4555356	total: 18m 22s	remaining: 2m 34s
877:	learn: 0.4555178	total: 18m 23s	remaining: 2m 33s
878:	learn: 0.4554841	total: 18m 24s	remaining: 2m 32s
879:	learn: 0.4554675	total: 18m 26s	remaining: 2m 30s
880:	learn: 0.4554524	total: 18m 27s	remaining: 2m 29s
881:	learn: 0.4554310	total: 18m 28s	remaining: 2m 28s
882:	learn: 0.4554088	total: 18m 28s	remaining: 2m 26s
883:	learn: 0.4553858	total: 18m 29s	remaining: 2m 25s
884:	learn: 0.4553601	total: 18m 30s	remaining: 2m 24s
885:	learn: 0.4553301	total: 18m 30s	remaining: 2m 22s
886:	learn: 0.4553016	total: 18m 31s	remaining: 2m 21s
887:	learn: 0.4552738	total: 18m 32s	remaining: 2m 20s
888:	learn: 0.4552353	total: 18m 33s	remaining: 2m 19s
889:	learn: 0.4552211	total: 18m 34s	remaining: 2m 17s
890:	learn: 0.4551784	total: 18m 35s	remaining: 2m 16s
891:	learn: 0.4551467	total: 18m 37s	remaining: 2m 15s
892:	learn: 0.4551264	total: 18m 38s	remaining: 2m 14s
893:	learn: 0.4550968	total: 18m 39s	remaining: 2m 12s
894:	learn: 0.4550786	total: 18m 41s	remaining: 2m 11s
895:	learn: 0.4550512	total: 18m 42s	remaining: 2m 10s
896:	learn: 0.4549713	total: 18m 43s	remaining: 2m 9s
897:	learn: 0.4549441	total: 18m 45s	remaining: 2m 7s
898:	learn: 0.4549265	total: 18m 45s	remaining: 2m 6s
899:	learn: 0.4549074	total: 18m 46s	remaining: 2m 5s
900:	learn: 0.4548841	total: 18m 47s	remaining: 2m 3s
901:	learn: 0.4548370	total: 18m 48s	remaining: 2m 2s
902:	learn: 0.4548082	total: 18m 49s	remaining: 2m 1s

903:	learn: 0.4547178	total: 18m 51s	remaining: 2m
904:	learn: 0.4546685	total: 18m 52s	remaining: 1m 58s
905:	learn: 0.4546424	total: 18m 53s	remaining: 1m 57s
906:	learn: 0.4546109	total: 18m 53s	remaining: 1m 56s
907:	learn: 0.4545900	total: 18m 54s	remaining: 1m 54s
908:	learn: 0.4545287	total: 18m 56s	remaining: 1m 53s
909:	learn: 0.4544462	total: 18m 58s	remaining: 1m 52s
910:	learn: 0.4544297	total: 18m 59s	remaining: 1m 51s
911:	learn: 0.4544115	total: 19m	remaining: 1m 50s
912:	learn: 0.4543898	total: 19m	remaining: 1m 48s
913:	learn: 0.4543341	total: 19m 1s	remaining: 1m 47s
914:	learn: 0.4543052	total: 19m 2s	remaining: 1m 46s
915:	learn: 0.4542813	total: 19m 3s	remaining: 1m 44s
916:	learn: 0.4542503	total: 19m 3s	remaining: 1m 43s
917:	learn: 0.4542277	total: 19m 4s	remaining: 1m 42s
918:	learn: 0.4542090	total: 19m 5s	remaining: 1m 40s
919:	learn: 0.4541755	total: 19m 6s	remaining: 1m 39s
920:	learn: 0.4541471	total: 19m 7s	remaining: 1m 38s
921:	learn: 0.4540986	total: 19m 8s	remaining: 1m 37s
922:	learn: 0.4540765	total: 19m 9s	remaining: 1m 35s
923:	learn: 0.4540554	total: 19m 10s	remaining: 1m 34s
924:	learn: 0.4540005	total: 19m 12s	remaining: 1m 33s
925:	learn: 0.4539177	total: 19m 13s	remaining: 1m 32s
926:	learn: 0.4539019	total: 19m 14s	remaining: 1m 30s
927:	learn: 0.4538745	total: 19m 15s	remaining: 1m 29s
928:	learn: 0.4538421	total: 19m 16s	remaining: 1m 28s
929:	learn: 0.4538156	total: 19m 17s	remaining: 1m 27s
930:	learn: 0.4537876	total: 19m 17s	remaining: 1m 25s
931:	learn: 0.4537054	total: 19m 18s	remaining: 1m 24s
932:	learn: 0.4536802	total: 19m 19s	remaining: 1m 23s
933:	learn: 0.4536476	total: 19m 20s	remaining: 1m 22s
934:	learn: 0.4536131	total: 19m 21s	remaining: 1m 20s
935:	learn: 0.4535195	total: 19m 22s	remaining: 1m 19s
936:	learn: 0.4534934	total: 19m 23s	remaining: 1m 18s
937:	learn: 0.4534623	total: 19m 24s	remaining: 1m 16s
938:	learn: 0.4534367	total: 19m 24s	remaining: 1m 15s
939:	learn: 0.4534241	total: 19m 25s	remaining: 1m 14s
940:	learn: 0.4534112	total: 19m 26s	remaining: 1m 13s
941:	learn: 0.4533178	total: 19m 30s	remaining: 1m 12s
942:	learn: 0.4532904	total: 19m 31s	remaining: 1m 10s
943:	learn: 0.4532567	total: 19m 32s	remaining: 1m 9s
944:	learn: 0.4532381	total: 19m 33s	remaining: 1m 8s
945:	learn: 0.4532183	total: 19m 34s	remaining: 1m 7s

946:	learn: 0.4531875	total: 19m 35s	remaining: 1m 5s
947:	learn: 0.4531566	total: 19m 35s	remaining: 1m 4s
948:	learn: 0.4530840	total: 19m 37s	remaining: 1m 3s
949:	learn: 0.4530641	total: 19m 37s	remaining: 1m 1s
950:	learn: 0.4530091	total: 19m 39s	remaining: 1m
951:	learn: 0.4529918	total: 19m 40s	remaining: 59.5s
952:	learn: 0.4529677	total: 19m 41s	remaining: 58.3s
953:	learn: 0.4529486	total: 19m 41s	remaining: 57s
954:	learn: 0.4529183	total: 19m 42s	remaining: 55.7s
955:	learn: 0.4529011	total: 19m 44s	remaining: 54.5s
956:	learn: 0.4528126	total: 19m 46s	remaining: 53.3s
957:	learn: 0.4527824	total: 19m 47s	remaining: 52.1s
958:	learn: 0.4527287	total: 19m 50s	remaining: 50.9s
959:	learn: 0.4527023	total: 19m 50s	remaining: 49.6s
960:	learn: 0.4526823	total: 19m 51s	remaining: 48.4s
961:	learn: 0.4526522	total: 19m 53s	remaining: 47.2s
962:	learn: 0.4526323	total: 19m 54s	remaining: 45.9s
963:	learn: 0.4525825	total: 19m 55s	remaining: 44.6s
964:	learn: 0.4525595	total: 19m 55s	remaining: 43.4s
965:	learn: 0.4525451	total: 19m 57s	remaining: 42.2s
966:	learn: 0.4525110	total: 19m 58s	remaining: 40.9s
967:	learn: 0.4524892	total: 19m 59s	remaining: 39.6s
968:	learn: 0.4524731	total: 19m 59s	remaining: 38.4s
969:	learn: 0.4524436	total: 20m	remaining: 37.1s
970:	learn: 0.4524327	total: 20m 1s	remaining: 35.9s
971:	learn: 0.4523942	total: 20m 2s	remaining: 34.7s
972:	learn: 0.4523734	total: 20m 3s	remaining: 33.4s
973:	learn: 0.4523474	total: 20m 4s	remaining: 32.2s
974:	learn: 0.4523266	total: 20m 5s	remaining: 30.9s
975:	learn: 0.4522904	total: 20m 5s	remaining: 29.7s
976:	learn: 0.4522106	total: 20m 8s	remaining: 28.4s
977:	learn: 0.4521892	total: 20m 8s	remaining: 27.2s
978:	learn: 0.4521587	total: 20m 9s	remaining: 25.9s
979:	learn: 0.4521309	total: 20m 11s	remaining: 24.7s
980:	learn: 0.4520818	total: 20m 13s	remaining: 23.5s
981:	learn: 0.4520593	total: 20m 13s	remaining: 22.3s
982:	learn: 0.4519908	total: 20m 15s	remaining: 21s
983:	learn: 0.4519653	total: 20m 16s	remaining: 19.8s
984:	learn: 0.4519377	total: 20m 17s	remaining: 18.5s
985:	learn: 0.4519177	total: 20m 19s	remaining: 17.3s
986:	learn: 0.4519026	total: 20m 20s	remaining: 16.1s
987:	learn: 0.4518764	total: 20m 21s	remaining: 14.8s
988:	learn: 0.4518591	total: 20m 22s	remaining: 13.6s

989:	learn: 0.4518438	total: 20m 23s	remaining: 12.4s
990:	learn: 0.4518098	total: 20m 23s	remaining: 11.1s
991:	learn: 0.4517775	total: 20m 24s	remaining: 9.87s
992:	learn: 0.4517541	total: 20m 25s	remaining: 8.63s
993:	learn: 0.4517326	total: 20m 25s	remaining: 7.4s
994:	learn: 0.4517090	total: 20m 26s	remaining: 6.16s
995:	learn: 0.4516939	total: 20m 27s	remaining: 4.93s
996:	learn: 0.4516728	total: 20m 27s	remaining: 3.69s
997:	learn: 0.4516499	total: 20m 30s	remaining: 2.46s
998:	learn: 0.4515650	total: 20m 34s	remaining: 1.24s
999:	learn: 0.4515435	total: 20m 35s	remaining: 0us

Out[203]: <catboost.core.CatBoostClassifier at 0x7f0fc05ac320>

```
In [204]: import pickle
pickle.dump(ce_model, open('catboost_ce_model.pkl', 'wb'))
```

```
In [205]: feature_importance_df = pd.DataFrame(zip(ce_model.feature_names_, ce_model.feature_importances_),
        columns=['Feature', 'Importance']).set_index('Feature').sort_values(by='Importance', ascending=False).head(25)
```

```
In [206]: feature_importance_df
```

Out[206]:

Importance	
Feature	
dom_intl_in	11.354136
htl_usd_rt	5.425489
orig_state	5.043438
seg_lvl_strt_month	4.980172
website	4.906092
agcy_nm	4.872365
trip_day_ct	4.790541
srce_nm	3.871665
state_cd	3.757989
trip_advance_days	3.706815
city_nm	3.349592
ctry_cd	3.214658
rgn_cd	2.958472
region_name	2.922132
pseudo_city_cd	2.701540
spend_category_27	2.479618
trvl_ctry_orig_rgn	2.326968
spend_category_51	1.949905
cm_dma	1.418368
airport_name	1.373866
spend_category_45	1.279883
spend_category_47	1.178061
card_ctgy	1.174836
spend_category_31	1.150450

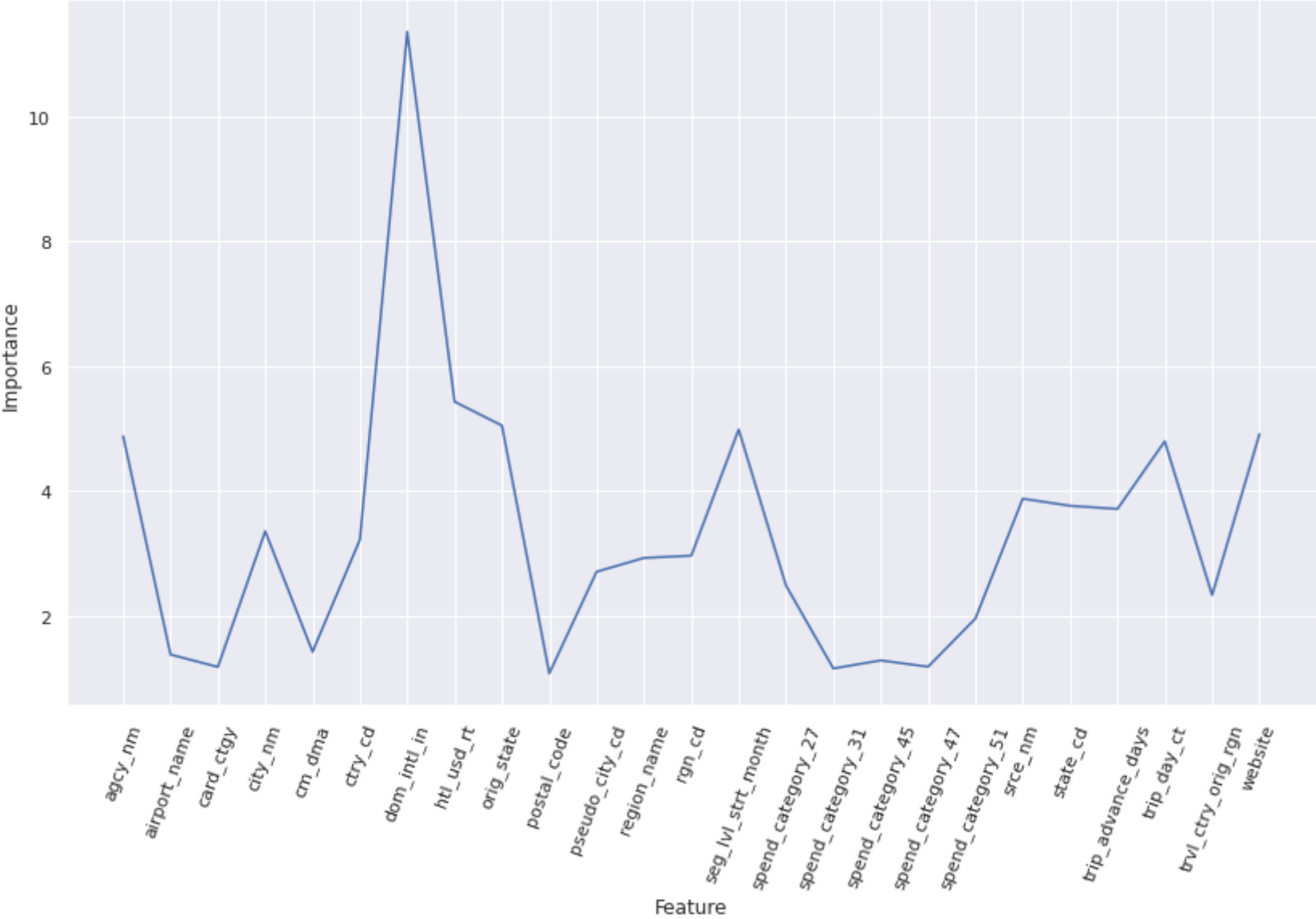
Importance	
Feature	
<hr/>	
postal_code	1.072381

```
In [207]: feature_importance_df = feature_importance_df.reset_index(level=0)
```



```
In [208]: import seaborn as sns
import matplotlib.pyplot as plt

# draw lineplot
sns.set(rc={'figure.figsize':(11.7,8.27)})
sns.lineplot(x="Feature", y="Importance", data=feature_importance_df)
plt.xticks(rotation=70)
plt.tight_layout()
```



```
In [209]: train_preds = pd.Series(ce_model.predict(X_train.drop(columns=['person_id'])), index=X_train.index)

print("Train classification report:")
print(classification_report(y_train, train_preds))
```

Train classification report:

	precision	recall	f1-score	support
0	0.94	0.80	0.87	374724
1	0.83	0.95	0.88	374304
accuracy			0.88	749028
macro avg	0.88	0.88	0.88	749028
weighted avg	0.88	0.88	0.88	749028

```
In [210]: test_preds = pd.Series(ce_model.predict(X_test.drop(columns=['person_id'])), index=X_test.index)

print("Test classification report:")
print(classification_report(y_test, test_preds))
```

Test classification report:

	precision	recall	f1-score	support
0	0.83	0.78	0.80	124628
1	0.79	0.84	0.81	125048
accuracy			0.81	249676
macro avg	0.81	0.81	0.81	249676
weighted avg	0.81	0.81	0.81	249676

```
In [211]: test_only_users = X_test['person_id'].isin(set(X_test['person_id'].unique())-set(X_train['person_id'].unique()))  
  
print(classification_report(y_test[test_only_users], test_preds[test_only_users]))
```

	precision	recall	f1-score	support
0	0.78	0.77	0.78	6066
1	0.77	0.79	0.78	6014
accuracy			0.78	12080
macro avg	0.78	0.78	0.78	12080
weighted avg	0.78	0.78	0.78	12080

In []: