In [1]:
```
import numpy as np
import pandas as pd
df = pd.read_csv("D://HeartData/switzerland.csv")
```

In [2]:
```
df['trestbps']=df['trestbps'].str.replace('?','0')
df['fbs']=df['fbs'].str.replace('?','0')
df['restecg']=df['restecg'].str.replace('?','0')
df['thalach']=df['thalach'].str.replace('?','0')
df['oldpeak']=df['oldpeak'].str.replace('?','0')
df['slope']=df['slope'].str.replace('?','0')
df['ca']=df['ca'].str.replace('?','0')
df['thal']=df['thal'].str.replace('?','0')
df['exang']=df['exang'].str.replace('?','0')
df.rename(columns={'num':'target'},inplace=True)
```

In [3]:
```
df['target']=df['target'].replace(3,1)
df['target']=df['target'].replace(2,1)
```

In [4]:
```
df[['trestbps','fbs','restecg','thalach','exang','oldpeak','slope','ca','thal']]=df[['trestbps','fbs','restecg','thalach','exang',
```

In [5]:
```
#Import Dependencies:
%matplotlib inline
#Start Python Imports:
import math,time,random,datetime
#Data Manipulation:
import numpy as np
import pandas as pd
#Visualization:
import matplotlib.pyplot as plt
import missingno
import seaborn as sns
plt.style.use('seaborn-whitegrid')
#Preprocessing:
from sklearn.preprocessing import OneHotEncoder,LabelEncoder,label_binarize
#Machine Learning:
import catboost
from sklearn.model_selection import train_test_split
from sklearn import model_selection,tree,preprocessing,metrics,linear_model
from sklearn.svm import LinearSVC
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.neighbors import KNeighborsClassifier
```

```
from sklearn.naive_bayes import GaussianNB
from sklearn.linear_model import LinearRegression,LogisticRegression,SGDClassifier
from sklearn.tree import DecisionTreeClassifier
from catboost import CatBoostClassifier,Pool,cv
#Let's be rebels and ignore warnings for now:
import warnings
warnings.filterwarnings("ignore")
```

```
C:\Users\Sasik\AppData\Roaming\Python\Python38\site-packages\statsmodels\tools\_testing.py:19: FutureWarning: pandas.util.testing
is deprecated. Use the functions in the public API at pandas.testing instead.
  import pandas.util.testing as tm
```

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 122 entries, 0 to 121
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       122 non-null    int64  
 1   sex       122 non-null    int64  
 2   cp        122 non-null    int64  
 3   trestbps  122 non-null    int64  
 4   chol      122 non-null    int64  
 5   fbs       122 non-null    int64  
 6   restecg   122 non-null    int64  
 7   thalach   122 non-null    int64  
 8   exang     122 non-null    int64  
 9   oldpeak   122 non-null    float64
 10  slope     122 non-null    int64  
 11  ca        122 non-null    int64  
 12  thal      122 non-null    int64  
 13  target    122 non-null    int64  
dtypes: float64(1), int64(13)
memory usage: 13.5 KB
```

In [7]:
```
# Split the dataframe into data and labels
X_train = df.drop('trestbps', axis=1) # data
y_train = df.target # labels
```

In [8]:
```
# Function that runs the requested algorithm and returns the accuracy metrics
def fit_ml_algo(algo, X_train, y_train, cv):

    # One Pass
    model = algo.fit(X_train, y_train)
    acc = round(model.score(X_train, y_train) * 100, 2)
```

```
    # Cross Validation
    train_pred = model_selection.cross_val_predict(algo,
                                                   X_train,
                                                   y_train,
                                                   cv=cv,
                                                   n_jobs = -1)
    # Cross-validation accuracy metric
    acc_cv = round(metrics.accuracy_score(y_train, train_pred) * 100, 2)

    return train_pred, acc, acc_cv
```

In [9]:
```
# Logistic Regression
start_time = time.time()
train_pred_log, acc_log, acc_cv_log = fit_ml_algo(LogisticRegression(),
                                                  X_train,
                                                  y_train,
                                                       10)
log_time = (time.time() - start_time)
print("Accuracy: %s" % acc_log)
print("Accuracy CV 10-Fold: %s" % acc_cv_log)
print("Running Time: %s" % datetime.timedelta(seconds=log_time))
```

```
Accuracy: 99.18
Accuracy CV 10-Fold: 95.9
Running Time: 0:00:04.432998
```

In [10]:
```
# k-Nearest Neighbours
start_time = time.time()
train_pred_knn, acc_knn, acc_cv_knn = fit_ml_algo(KNeighborsClassifier(),
                                                  X_train,
                                                  y_train,
                                                  10)
knn_time = (time.time() - start_time)
print("Accuracy: %s" % acc_knn)
print("Accuracy CV 10-Fold: %s" % acc_cv_knn)
print("Running Time: %s" % datetime.timedelta(seconds=knn_time))
```

```
Accuracy: 89.34
Accuracy CV 10-Fold: 89.34
Running Time: 0:00:00.173037
```

In [11]:
```
# Gaussian Naive Bayes
start_time = time.time()
train_pred_gaussian, acc_gaussian, acc_cv_gaussian = fit_ml_algo(GaussianNB(),
```

```
                                                                X_train,
                                                                y_train,
                                                                     10)
gaussian_time = (time.time() - start_time)
print("Accuracy: %s" % acc_gaussian)
print("Accuracy CV 10-Fold: %s" % acc_cv_gaussian)
print("Running Time: %s" % datetime.timedelta(seconds=gaussian_time))
```

```
Accuracy: 100.0
Accuracy CV 10-Fold: 98.36
Running Time: 0:00:00.033936
```

In [12]:
```
# Linear SVC
start_time = time.time()
train_pred_svc, acc_linear_svc, acc_cv_linear_svc = fit_ml_algo(LinearSVC(),
                                                                X_train,
                                                                y_train,
                                                                10)
linear_svc_time = (time.time() - start_time)
print("Accuracy: %s" % acc_linear_svc)
print("Accuracy CV 10-Fold: %s" % acc_cv_linear_svc)
print("Running Time: %s" % datetime.timedelta(seconds=linear_svc_time))
```

```
Accuracy: 22.13
Accuracy CV 10-Fold: 93.44
Running Time: 0:00:00.117673
```

In [13]:
```
# Stochastic Gradient Descent
start_time = time.time()
train_pred_sgd, acc_sgd, acc_cv_sgd = fit_ml_algo(SGDClassifier(),
                                                  X_train,
                                                  y_train,
                                                  10)
sgd_time = (time.time() - start_time)
print("Accuracy: %s" % acc_sgd)
print("Accuracy CV 10-Fold: %s" % acc_cv_sgd)
print("Running Time: %s" % datetime.timedelta(seconds=sgd_time))
```

```
Accuracy: 65.57
Accuracy CV 10-Fold: 81.15
Running Time: 0:00:00.132901
```

In [14]:
```
# Decision Tree Classifier
start_time = time.time()
train_pred_dt, acc_dt, acc_cv_dt = fit_ml_algo(DecisionTreeClassifier(),
                                                                X_train,
```

```
                                                                y_train,
                                                                10)
dt_time = (time.time() - start_time)
print("Accuracy: %s" % acc_dt)
print("Accuracy CV 10-Fold: %s" % acc_cv_dt)
print("Running Time: %s" % datetime.timedelta(seconds=dt_time))
```

```
Accuracy: 100.0
Accuracy CV 10-Fold: 100.0
Running Time: 0:00:00.134326
```

In [15]:
```
# Gradient Boosting Trees
start_time = time.time()
train_pred_gbt, acc_gbt, acc_cv_gbt = fit_ml_algo(GradientBoostingClassifier(),
                                                                X_train,
                                                                y_train,
                                                                10)
gbt_time = (time.time() - start_time)
print("Accuracy: %s" % acc_gbt)
print("Accuracy CV 10-Fold: %s" % acc_cv_gbt)
print("Running Time: %s" % datetime.timedelta(seconds=gbt_time))
```

```
Accuracy: 100.0
Accuracy CV 10-Fold: 100.0
Running Time: 0:00:00.606483
```

In [16]:
```
# Define the categorical features for the CatBoost model
cat_features = np.where(X_train.dtypes != np.float)[0]
cat_features
```

Out[16]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  9, 10, 11, 12], dtype=int64)
```

In [17]:
```
# Use the CatBoost Pool() function to pool together the training data and categorical feature labels
train_pool = Pool(X_train,
                  y_train,
                  cat_features)
```

In [19]:
```
catboost_model = CatBoostClassifier(iterations=1000,
                                    custom_loss=['Accuracy'],
                                    loss_function='MultiClass')

# Fit CatBoost model
catboost_model.fit(train_pool,
                   plot=True)
```

```
# CatBoost accuracy
acc_catboost = round(catboost_model.score(X_train, y_train) * 100, 2)
```

```
Custom logger is already specified. Specify more than one logger at same time is not thread safe.

Learning rate set to 0.071077
0:      learn: 1.0116332        total: 322ms    remaining: 5m 21s
1:      learn: 0.9140200        total: 353ms    remaining: 2m 56s
2:      learn: 0.8396660        total: 391ms    remaining: 2m 10s
3:      learn: 0.7749917        total: 454ms    remaining: 1m 53s
4:      learn: 0.7125055        total: 507ms    remaining: 1m 40s
5:      learn: 0.6544119        total: 535ms    remaining: 1m 28s
6:      learn: 0.6079248        total: 547ms    remaining: 1m 17s
7:      learn: 0.5701956        total: 584ms    remaining: 1m 12s
8:      learn: 0.5340929        total: 617ms    remaining: 1m 7s
9:      learn: 0.4974975        total: 637ms    remaining: 1m 3s
10:     learn: 0.4693294        total: 666ms    remaining: 59.9s
11:     learn: 0.4405942        total: 699ms    remaining: 57.5s
12:     learn: 0.4119629        total: 728ms    remaining: 55.3s
13:     learn: 0.3887486        total: 741ms    remaining: 52.2s
14:     learn: 0.3657950        total: 794ms    remaining: 52.1s
15:     learn: 0.3513593        total: 802ms    remaining: 49.3s
16:     learn: 0.3316215        total: 821ms    remaining: 47.5s
17:     learn: 0.3144965        total: 831ms    remaining: 45.3s
18:     learn: 0.2980796        total: 933ms    remaining: 48.2s
19:     learn: 0.2828342        total: 996ms    remaining: 48.8s
20:     learn: 0.2683353        total: 1.02s    remaining: 47.8s
21:     learn: 0.2568158        total: 1.06s    remaining: 47.2s
22:     learn: 0.2447030        total: 1.1s     remaining: 46.7s
23:     learn: 0.2321092        total: 1.12s    remaining: 45.4s
24:     learn: 0.2234932        total: 1.14s    remaining: 44.4s
25:     learn: 0.2149302        total: 1.17s    remaining: 43.8s
26:     learn: 0.2059072        total: 1.21s    remaining: 43.5s
27:     learn: 0.1971623        total: 1.23s    remaining: 42.7s
28:     learn: 0.1880706        total: 1.26s    remaining: 42.2s
29:     learn: 0.1793122        total: 1.28s    remaining: 41.4s
30:     learn: 0.1722806        total: 1.32s    remaining: 41.2s
31:     learn: 0.1679591        total: 1.35s    remaining: 40.9s
32:     learn: 0.1611575        total: 1.38s    remaining: 40.4s
33:     learn: 0.1525360        total: 1.39s    remaining: 39.5s
34:     learn: 0.1459918        total: 1.41s    remaining: 39s
35:     learn: 0.1395807        total: 1.44s    remaining: 38.6s
36:     learn: 0.1324211        total: 1.46s    remaining: 38s
37:     learn: 0.1271095        total: 1.48s    remaining: 37.5s
38:     learn: 0.1223286        total: 1.5s     remaining: 36.9s
39:     learn: 0.1181695        total: 1.53s    remaining: 36.8s
```

```
40:     learn: 0.1130380        total: 1.55s    remaining: 36.4s
41:     learn: 0.1088412        total: 1.57s    remaining: 35.8s
42:     learn: 0.1053166        total: 1.62s    remaining: 36s
43:     learn: 0.1017350        total: 1.66s    remaining: 36s
44:     learn: 0.0983872        total: 1.69s    remaining: 35.9s
45:     learn: 0.0953056        total: 1.72s    remaining: 35.7s
46:     learn: 0.0920964        total: 1.76s    remaining: 35.7s
47:     learn: 0.0904067        total: 1.79s    remaining: 35.5s
48:     learn: 0.0870521        total: 1.82s    remaining: 35.4s
49:     learn: 0.0844530        total: 1.86s    remaining: 35.4s
50:     learn: 0.0824832        total: 1.9s     remaining: 35.4s
51:     learn: 0.0803745        total: 1.93s    remaining: 35.3s
52:     learn: 0.0782553        total: 1.96s    remaining: 35s
53:     learn: 0.0761873        total: 1.99s    remaining: 34.8s
54:     learn: 0.0736845        total: 2s       remaining: 34.4s
55:     learn: 0.0719555        total: 2.04s    remaining: 34.4s
56:     learn: 0.0700928        total: 2.08s    remaining: 34.4s
57:     learn: 0.0679393        total: 2.11s    remaining: 34.2s
58:     learn: 0.0663841        total: 2.13s    remaining: 34s
59:     learn: 0.0645454        total: 2.17s    remaining: 34s
60:     learn: 0.0634349        total: 2.2s     remaining: 33.9s
61:     learn: 0.0616874        total: 2.23s    remaining: 33.7s
62:     learn: 0.0601153        total: 2.25s    remaining: 33.5s
63:     learn: 0.0579270        total: 2.27s    remaining: 33.2s
64:     learn: 0.0566389        total: 2.31s    remaining: 33.3s
65:     learn: 0.0559408        total: 2.35s    remaining: 33.2s
66:     learn: 0.0546458        total: 2.39s    remaining: 33.3s
67:     learn: 0.0531795        total: 2.41s    remaining: 33s
68:     learn: 0.0518930        total: 2.43s    remaining: 32.8s
69:     learn: 0.0510826        total: 2.46s    remaining: 32.7s
70:     learn: 0.0498022        total: 2.49s    remaining: 32.6s
71:     learn: 0.0486100        total: 2.52s    remaining: 32.5s
72:     learn: 0.0477433        total: 2.54s    remaining: 32.3s
73:     learn: 0.0471076        total: 2.58s    remaining: 32.3s
74:     learn: 0.0463302        total: 2.6s     remaining: 32s
75:     learn: 0.0449920        total: 2.62s    remaining: 31.8s
76:     learn: 0.0440535        total: 2.65s    remaining: 31.8s
77:     learn: 0.0431852        total: 2.69s    remaining: 31.8s
78:     learn: 0.0423932        total: 2.73s    remaining: 31.8s
79:     learn: 0.0417339        total: 2.79s    remaining: 32.1s
80:     learn: 0.0411636        total: 2.84s    remaining: 32.2s
81:     learn: 0.0406191        total: 2.89s    remaining: 32.3s
82:     learn: 0.0399366        total: 2.96s    remaining: 32.7s
83:     learn: 0.0392951        total: 3s       remaining: 32.7s
84:     learn: 0.0385709        total: 3.03s    remaining: 32.7s
85:     learn: 0.0380210        total: 3.08s    remaining: 32.7s
86:     learn: 0.0372279        total: 3.11s    remaining: 32.7s
```

```
87:     learn: 0.0365836        total: 3.19s    remaining: 33s
88:     learn: 0.0358036        total: 3.22s    remaining: 32.9s
89:     learn: 0.0351776        total: 3.25s    remaining: 32.9s
90:     learn: 0.0348178        total: 3.29s    remaining: 32.9s
91:     learn: 0.0343983        total: 3.34s    remaining: 33s
92:     learn: 0.0339348        total: 3.38s    remaining: 33s
93:     learn: 0.0335600        total: 3.41s    remaining: 32.8s
94:     learn: 0.0330417        total: 3.44s    remaining: 32.8s
95:     learn: 0.0326791        total: 3.47s    remaining: 32.7s
96:     learn: 0.0320276        total: 3.49s    remaining: 32.5s
97:     learn: 0.0317321        total: 3.52s    remaining: 32.4s
98:     learn: 0.0313521        total: 3.56s    remaining: 32.4s
99:     learn: 0.0309531        total: 3.62s    remaining: 32.5s
100:    learn: 0.0303520        total: 3.65s    remaining: 32.5s
101:    learn: 0.0301511        total: 3.68s    remaining: 32.4s
102:    learn: 0.0297777        total: 3.71s    remaining: 32.3s
103:    learn: 0.0295247        total: 3.75s    remaining: 32.3s
104:    learn: 0.0292969        total: 3.78s    remaining: 32.2s
105:    learn: 0.0289217        total: 3.82s    remaining: 32.2s
106:    learn: 0.0284381        total: 3.85s    remaining: 32.1s
107:    learn: 0.0282239        total: 3.88s    remaining: 32.1s
108:    learn: 0.0277956        total: 3.91s    remaining: 32s
109:    learn: 0.0274621        total: 3.95s    remaining: 31.9s
110:    learn: 0.0272464        total: 3.98s    remaining: 31.9s
111:    learn: 0.0270416        total: 4.02s    remaining: 31.9s
112:    learn: 0.0267809        total: 4.07s    remaining: 31.9s
113:    learn: 0.0266317        total: 4.1s     remaining: 31.9s
114:    learn: 0.0263746        total: 4.14s    remaining: 31.8s
115:    learn: 0.0261492        total: 4.17s    remaining: 31.8s
116:    learn: 0.0258887        total: 4.23s    remaining: 31.9s
117:    learn: 0.0256587        total: 4.26s    remaining: 31.9s
118:    learn: 0.0254643        total: 4.31s    remaining: 31.9s
119:    learn: 0.0252450        total: 4.34s    remaining: 31.9s
120:    learn: 0.0249741        total: 4.37s    remaining: 31.8s
121:    learn: 0.0248022        total: 4.41s    remaining: 31.7s
122:    learn: 0.0246153        total: 4.46s    remaining: 31.8s
123:    learn: 0.0244903        total: 4.51s    remaining: 31.9s
124:    learn: 0.0242482        total: 4.56s    remaining: 31.9s
125:    learn: 0.0239744        total: 4.6s     remaining: 31.9s
126:    learn: 0.0237543        total: 4.65s    remaining: 32s
127:    learn: 0.0235972        total: 4.69s    remaining: 32s
128:    learn: 0.0234358        total: 4.76s    remaining: 32.1s
129:    learn: 0.0232952        total: 4.83s    remaining: 32.3s
130:    learn: 0.0231088        total: 4.88s    remaining: 32.4s
131:    learn: 0.0229166        total: 4.91s    remaining: 32.3s
132:    learn: 0.0227959        total: 4.94s    remaining: 32.2s
133:    learn: 0.0226482        total: 4.97s    remaining: 32.2s
```

```
134:    learn: 0.0224147        total: 5.03s    remaining: 32.2s
135:    learn: 0.0222883        total: 5.08s    remaining: 32.3s
136:    learn: 0.0220995        total: 5.12s    remaining: 32.3s
137:    learn: 0.0218632        total: 5.16s    remaining: 32.2s
138:    learn: 0.0216936        total: 5.19s    remaining: 32.2s
139:    learn: 0.0215071        total: 5.24s    remaining: 32.2s
140:    learn: 0.0213638        total: 5.28s    remaining: 32.2s
141:    learn: 0.0212103        total: 5.33s    remaining: 32.2s
142:    learn: 0.0210487        total: 5.37s    remaining: 32.2s
143:    learn: 0.0209166        total: 5.42s    remaining: 32.2s
144:    learn: 0.0207798        total: 5.47s    remaining: 32.3s
145:    learn: 0.0206195        total: 5.51s    remaining: 32.3s
146:    learn: 0.0204989        total: 5.57s    remaining: 32.3s
147:    learn: 0.0203668        total: 5.6s     remaining: 32.3s
148:    learn: 0.0202602        total: 5.65s    remaining: 32.3s
149:    learn: 0.0200732        total: 5.69s    remaining: 32.3s
150:    learn: 0.0199827        total: 5.74s    remaining: 32.2s
151:    learn: 0.0198698        total: 5.77s    remaining: 32.2s
152:    learn: 0.0197406        total: 5.81s    remaining: 32.2s
153:    learn: 0.0196147        total: 5.85s    remaining: 32.2s
154:    learn: 0.0195192        total: 5.89s    remaining: 32.1s
155:    learn: 0.0194099        total: 5.94s    remaining: 32.1s
156:    learn: 0.0192851        total: 5.97s    remaining: 32s
157:    learn: 0.0190851        total: 6.01s    remaining: 32s
158:    learn: 0.0189413        total: 6.05s    remaining: 32s
159:    learn: 0.0188326        total: 6.11s    remaining: 32.1s
160:    learn: 0.0187064        total: 6.16s    remaining: 32.1s
161:    learn: 0.0185734        total: 6.19s    remaining: 32s
162:    learn: 0.0184091        total: 6.24s    remaining: 32s
163:    learn: 0.0182685        total: 6.28s    remaining: 32s
164:    learn: 0.0181917        total: 6.33s    remaining: 32s
165:    learn: 0.0180436        total: 6.36s    remaining: 32s
166:    learn: 0.0178779        total: 6.4s     remaining: 31.9s
167:    learn: 0.0177654        total: 6.43s    remaining: 31.9s
168:    learn: 0.0176575        total: 6.47s    remaining: 31.8s
169:    learn: 0.0175346        total: 6.51s    remaining: 31.8s
170:    learn: 0.0173511        total: 6.55s    remaining: 31.8s
171:    learn: 0.0172295        total: 6.59s    remaining: 31.7s
172:    learn: 0.0170945        total: 6.63s    remaining: 31.7s
173:    learn: 0.0169763        total: 6.66s    remaining: 31.6s
174:    learn: 0.0168744        total: 6.71s    remaining: 31.6s
175:    learn: 0.0168133        total: 6.75s    remaining: 31.6s
176:    learn: 0.0167264        total: 6.79s    remaining: 31.6s
177:    learn: 0.0166199        total: 6.87s    remaining: 31.7s
178:    learn: 0.0164718        total: 6.91s    remaining: 31.7s
179:    learn: 0.0163900        total: 6.94s    remaining: 31.6s
180:    learn: 0.0162975        total: 7s       remaining: 31.7s
```

```
181:    learn: 0.0161716        total: 7.04s    remaining: 31.6s
182:    learn: 0.0160897        total: 7.09s    remaining: 31.6s
183:    learn: 0.0160028        total: 7.14s    remaining: 31.7s
184:    learn: 0.0159300        total: 7.17s    remaining: 31.6s
185:    learn: 0.0158283        total: 7.23s    remaining: 31.6s
186:    learn: 0.0157275        total: 7.3s     remaining: 31.7s
187:    learn: 0.0156339        total: 7.34s    remaining: 31.7s
188:    learn: 0.0155580        total: 7.38s    remaining: 31.7s
189:    learn: 0.0154436        total: 7.45s    remaining: 31.7s
190:    learn: 0.0153394        total: 7.5s     remaining: 31.8s
191:    learn: 0.0152501        total: 7.55s    remaining: 31.8s
192:    learn: 0.0151965        total: 7.6s     remaining: 31.8s
193:    learn: 0.0151092        total: 7.66s    remaining: 31.8s
194:    learn: 0.0150337        total: 7.74s    remaining: 32s
195:    learn: 0.0149635        total: 7.79s    remaining: 32s
196:    learn: 0.0149080        total: 7.84s    remaining: 31.9s
197:    learn: 0.0148602        total: 7.88s    remaining: 31.9s
198:    learn: 0.0148062        total: 7.92s    remaining: 31.9s
199:    learn: 0.0147348        total: 7.97s    remaining: 31.9s
200:    learn: 0.0146577        total: 8.01s    remaining: 31.8s
201:    learn: 0.0145826        total: 8.06s    remaining: 31.9s
202:    learn: 0.0145269        total: 8.11s    remaining: 31.8s
203:    learn: 0.0144722        total: 8.15s    remaining: 31.8s
204:    learn: 0.0143726        total: 8.21s    remaining: 31.8s
205:    learn: 0.0143273        total: 8.25s    remaining: 31.8s
206:    learn: 0.0142572        total: 8.29s    remaining: 31.8s
207:    learn: 0.0142015        total: 8.34s    remaining: 31.8s
208:    learn: 0.0141253        total: 8.38s    remaining: 31.7s
209:    learn: 0.0140501        total: 8.44s    remaining: 31.7s
210:    learn: 0.0139901        total: 8.51s    remaining: 31.8s
211:    learn: 0.0139241        total: 8.54s    remaining: 31.7s
212:    learn: 0.0138712        total: 8.59s    remaining: 31.7s
213:    learn: 0.0138021        total: 8.63s    remaining: 31.7s
214:    learn: 0.0137309        total: 8.67s    remaining: 31.7s
215:    learn: 0.0136459        total: 8.72s    remaining: 31.7s
216:    learn: 0.0135801        total: 8.76s    remaining: 31.6s
217:    learn: 0.0134976        total: 8.8s     remaining: 31.6s
218:    learn: 0.0134104        total: 8.89s    remaining: 31.7s
219:    learn: 0.0133483        total: 8.94s    remaining: 31.7s
220:    learn: 0.0132683        total: 8.98s    remaining: 31.7s
221:    learn: 0.0132116        total: 9.02s    remaining: 31.6s
222:    learn: 0.0131683        total: 9.1s     remaining: 31.7s
223:    learn: 0.0131132        total: 9.17s    remaining: 31.8s
224:    learn: 0.0130679        total: 9.21s    remaining: 31.7s
225:    learn: 0.0129975        total: 9.29s    remaining: 31.8s
226:    learn: 0.0129008        total: 9.36s    remaining: 31.9s
227:    learn: 0.0128392        total: 9.4s     remaining: 31.8s
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228:    learn: 0.0127844        total: 9.43s    remaining: 31.8s
229:    learn: 0.0127305        total: 9.47s    remaining: 31.7s
230:    learn: 0.0126644        total: 9.51s    remaining: 31.6s
231:    learn: 0.0126191        total: 9.55s    remaining: 31.6s
232:    learn: 0.0125465        total: 9.59s    remaining: 31.6s
233:    learn: 0.0124779        total: 9.63s    remaining: 31.5s
234:    learn: 0.0124238        total: 9.67s    remaining: 31.5s
235:    learn: 0.0123735        total: 9.73s    remaining: 31.5s
236:    learn: 0.0123283        total: 9.77s    remaining: 31.5s
237:    learn: 0.0122520        total: 9.82s    remaining: 31.4s
238:    learn: 0.0121849        total: 9.85s    remaining: 31.4s
239:    learn: 0.0121381        total: 9.89s    remaining: 31.3s
240:    learn: 0.0120459        total: 9.92s    remaining: 31.3s
241:    learn: 0.0119947        total: 9.96s    remaining: 31.2s
242:    learn: 0.0119583        total: 10s      remaining: 31.2s
243:    learn: 0.0119086        total: 10.1s    remaining: 31.2s
244:    learn: 0.0118388        total: 10.1s    remaining: 31.2s
245:    learn: 0.0117987        total: 10.2s    remaining: 31.1s
246:    learn: 0.0117519        total: 10.2s    remaining: 31.1s
247:    learn: 0.0117130        total: 10.2s    remaining: 31.1s
248:    learn: 0.0116591        total: 10.3s    remaining: 31.1s
249:    learn: 0.0115748        total: 10.3s    remaining: 31s
250:    learn: 0.0115346        total: 10.4s    remaining: 30.9s
251:    learn: 0.0114794        total: 10.4s    remaining: 30.9s
252:    learn: 0.0114361        total: 10.5s    remaining: 30.9s
253:    learn: 0.0113926        total: 10.5s    remaining: 30.9s
254:    learn: 0.0113450        total: 10.5s    remaining: 30.8s
255:    learn: 0.0113048        total: 10.6s    remaining: 30.7s
256:    learn: 0.0112630        total: 10.6s    remaining: 30.7s
257:    learn: 0.0112309        total: 10.7s    remaining: 30.7s
258:    learn: 0.0111897        total: 10.7s    remaining: 30.7s
259:    learn: 0.0111361        total: 10.8s    remaining: 30.6s
260:    learn: 0.0110879        total: 10.8s    remaining: 30.7s
261:    learn: 0.0110486        total: 10.9s    remaining: 30.7s
262:    learn: 0.0110100        total: 10.9s    remaining: 30.6s
263:    learn: 0.0109604        total: 11s      remaining: 30.6s
264:    learn: 0.0109242        total: 11s      remaining: 30.6s
265:    learn: 0.0108652        total: 11.1s    remaining: 30.5s
266:    learn: 0.0108248        total: 11.1s    remaining: 30.6s
267:    learn: 0.0107892        total: 11.2s    remaining: 30.5s
268:    learn: 0.0107317        total: 11.2s    remaining: 30.5s
269:    learn: 0.0106995        total: 11.3s    remaining: 30.4s
270:    learn: 0.0106611        total: 11.3s    remaining: 30.4s
271:    learn: 0.0106041        total: 11.3s    remaining: 30.4s
272:    learn: 0.0105805        total: 11.4s    remaining: 30.3s
273:    learn: 0.0105410        total: 11.5s    remaining: 30.4s
274:    learn: 0.0104879        total: 11.5s    remaining: 30.4s
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275:    learn: 0.0104464        total: 11.6s    remaining: 30.3s
276:    learn: 0.0104085        total: 11.6s    remaining: 30.3s
277:    learn: 0.0103784        total: 11.7s    remaining: 30.3s
278:    learn: 0.0103469        total: 11.7s    remaining: 30.2s
279:    learn: 0.0103023        total: 11.7s    remaining: 30.2s
280:    learn: 0.0102598        total: 11.8s    remaining: 30.1s
281:    learn: 0.0102203        total: 11.8s    remaining: 30.1s
282:    learn: 0.0101789        total: 11.9s    remaining: 30s
283:    learn: 0.0101613        total: 11.9s    remaining: 30s
284:    learn: 0.0101314        total: 11.9s    remaining: 30s
285:    learn: 0.0100799        total: 12s      remaining: 29.9s
286:    learn: 0.0100369        total: 12s      remaining: 29.9s
287:    learn: 0.0100093        total: 12.1s    remaining: 29.8s
288:    learn: 0.0099787        total: 12.1s    remaining: 29.8s
289:    learn: 0.0099444        total: 12.2s    remaining: 29.7s
290:    learn: 0.0099066        total: 12.2s    remaining: 29.7s
291:    learn: 0.0098772        total: 12.2s    remaining: 29.6s
292:    learn: 0.0098490        total: 12.3s    remaining: 29.6s
293:    learn: 0.0098185        total: 12.3s    remaining: 29.5s
294:    learn: 0.0097857        total: 12.4s    remaining: 29.5s
295:    learn: 0.0097615        total: 12.4s    remaining: 29.5s
296:    learn: 0.0097284        total: 12.5s    remaining: 29.5s
297:    learn: 0.0097048        total: 12.5s    remaining: 29.5s
298:    learn: 0.0096693        total: 12.6s    remaining: 29.6s
299:    learn: 0.0096370        total: 12.7s    remaining: 29.5s
300:    learn: 0.0095897        total: 12.7s    remaining: 29.5s
301:    learn: 0.0095582        total: 12.8s    remaining: 29.5s
302:    learn: 0.0095319        total: 12.8s    remaining: 29.5s
303:    learn: 0.0094943        total: 12.9s    remaining: 29.4s
304:    learn: 0.0094489        total: 12.9s    remaining: 29.4s
305:    learn: 0.0094270        total: 13s      remaining: 29.4s
306:    learn: 0.0094007        total: 13.1s    remaining: 29.5s
307:    learn: 0.0093800        total: 13.1s    remaining: 29.4s
308:    learn: 0.0093486        total: 13.2s    remaining: 29.4s
309:    learn: 0.0093064        total: 13.2s    remaining: 29.3s
310:    learn: 0.0092769        total: 13.2s    remaining: 29.3s
311:    learn: 0.0092515        total: 13.3s    remaining: 29.3s
312:    learn: 0.0092263        total: 13.3s    remaining: 29.3s
313:    learn: 0.0092010        total: 13.4s    remaining: 29.3s
314:    learn: 0.0091731        total: 13.5s    remaining: 29.3s
315:    learn: 0.0091425        total: 13.5s    remaining: 29.2s
316:    learn: 0.0091111        total: 13.5s    remaining: 29.2s
317:    learn: 0.0090872        total: 13.6s    remaining: 29.1s
318:    learn: 0.0090623        total: 13.6s    remaining: 29.1s
319:    learn: 0.0090346        total: 13.7s    remaining: 29s
320:    learn: 0.0090054        total: 13.7s    remaining: 29s
321:    learn: 0.0089738        total: 13.8s    remaining: 29s
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322:    learn: 0.0089348        total: 13.8s    remaining: 28.9s
323:    learn: 0.0089088        total: 13.8s    remaining: 28.9s
324:    learn: 0.0088888        total: 13.9s    remaining: 28.9s
325:    learn: 0.0088705        total: 13.9s    remaining: 28.8s
326:    learn: 0.0088448        total: 14s      remaining: 28.7s
327:    learn: 0.0088253        total: 14s      remaining: 28.7s
328:    learn: 0.0087982        total: 14.1s    remaining: 28.8s
329:    learn: 0.0087707        total: 14.2s    remaining: 28.7s
330:    learn: 0.0087389        total: 14.2s    remaining: 28.7s
331:    learn: 0.0087185        total: 14.3s    remaining: 28.7s
332:    learn: 0.0086757        total: 14.3s    remaining: 28.7s
333:    learn: 0.0086469        total: 14.4s    remaining: 28.7s
334:    learn: 0.0086198        total: 14.4s    remaining: 28.6s
335:    learn: 0.0085900        total: 14.5s    remaining: 28.6s
336:    learn: 0.0085613        total: 14.5s    remaining: 28.6s
337:    learn: 0.0085321        total: 14.6s    remaining: 28.5s
338:    learn: 0.0084890        total: 14.6s    remaining: 28.5s
339:    learn: 0.0084670        total: 14.6s    remaining: 28.4s
340:    learn: 0.0084368        total: 14.7s    remaining: 28.4s
341:    learn: 0.0084160        total: 14.8s    remaining: 28.4s
342:    learn: 0.0083966        total: 14.8s    remaining: 28.4s
343:    learn: 0.0083761        total: 14.9s    remaining: 28.3s
344:    learn: 0.0083523        total: 14.9s    remaining: 28.3s
345:    learn: 0.0083317        total: 14.9s    remaining: 28.2s
346:    learn: 0.0083148        total: 15s      remaining: 28.2s
347:    learn: 0.0082982        total: 15s      remaining: 28.2s
348:    learn: 0.0082745        total: 15.1s    remaining: 28.2s
349:    learn: 0.0082432        total: 15.2s    remaining: 28.2s
350:    learn: 0.0082206        total: 15.2s    remaining: 28.1s
351:    learn: 0.0081988        total: 15.3s    remaining: 28.1s
352:    learn: 0.0081699        total: 15.3s    remaining: 28s
353:    learn: 0.0081527        total: 15.3s    remaining: 28s
354:    learn: 0.0081136        total: 15.4s    remaining: 27.9s
355:    learn: 0.0080935        total: 15.4s    remaining: 27.9s
356:    learn: 0.0080730        total: 15.5s    remaining: 27.9s
357:    learn: 0.0080498        total: 15.5s    remaining: 27.9s
358:    learn: 0.0080223        total: 15.6s    remaining: 27.9s
359:    learn: 0.0079958        total: 15.7s    remaining: 27.9s
360:    learn: 0.0079751        total: 15.7s    remaining: 27.8s
361:    learn: 0.0079531        total: 15.8s    remaining: 27.8s
362:    learn: 0.0079226        total: 15.8s    remaining: 27.7s
363:    learn: 0.0079031        total: 15.9s    remaining: 27.7s
364:    learn: 0.0078792        total: 15.9s    remaining: 27.7s
365:    learn: 0.0078545        total: 15.9s    remaining: 27.6s
366:    learn: 0.0078322        total: 16s      remaining: 27.6s
367:    learn: 0.0078137        total: 16s      remaining: 27.5s
368:    learn: 0.0077903        total: 16.1s    remaining: 27.5s
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369:    learn: 0.0077693        total: 16.2s    remaining: 27.5s
370:    learn: 0.0077547        total: 16.2s    remaining: 27.5s
371:    learn: 0.0077456        total: 16.2s    remaining: 27.4s
372:    learn: 0.0077241        total: 16.3s    remaining: 27.4s
373:    learn: 0.0077018        total: 16.3s    remaining: 27.3s
374:    learn: 0.0076752        total: 16.4s    remaining: 27.3s
375:    learn: 0.0076534        total: 16.4s    remaining: 27.2s
376:    learn: 0.0076348        total: 16.5s    remaining: 27.2s
377:    learn: 0.0076043        total: 16.5s    remaining: 27.2s
378:    learn: 0.0075805        total: 16.6s    remaining: 27.2s
379:    learn: 0.0075601        total: 16.6s    remaining: 27.1s
380:    learn: 0.0075440        total: 16.6s    remaining: 27s
381:    learn: 0.0075263        total: 16.7s    remaining: 27s
382:    learn: 0.0075097        total: 16.7s    remaining: 26.9s
383:    learn: 0.0074859        total: 16.8s    remaining: 26.9s
384:    learn: 0.0074669        total: 16.8s    remaining: 26.9s
385:    learn: 0.0074505        total: 16.8s    remaining: 26.8s
386:    learn: 0.0074295        total: 16.9s    remaining: 26.7s
387:    learn: 0.0074162        total: 16.9s    remaining: 26.7s
388:    learn: 0.0074007        total: 17s      remaining: 26.7s
389:    learn: 0.0073830        total: 17s      remaining: 26.6s
390:    learn: 0.0073644        total: 17.1s    remaining: 26.6s
391:    learn: 0.0073514        total: 17.1s    remaining: 26.6s
392:    learn: 0.0073244        total: 17.2s    remaining: 26.6s
393:    learn: 0.0073031        total: 17.3s    remaining: 26.5s
394:    learn: 0.0072803        total: 17.3s    remaining: 26.5s
395:    learn: 0.0072560        total: 17.3s    remaining: 26.4s
396:    learn: 0.0072420        total: 17.4s    remaining: 26.4s
397:    learn: 0.0072291        total: 17.4s    remaining: 26.4s
398:    learn: 0.0072135        total: 17.5s    remaining: 26.3s
399:    learn: 0.0071931        total: 17.5s    remaining: 26.3s
400:    learn: 0.0071768        total: 17.6s    remaining: 26.2s
401:    learn: 0.0071499        total: 17.6s    remaining: 26.2s
402:    learn: 0.0071318        total: 17.6s    remaining: 26.1s
403:    learn: 0.0071145        total: 17.7s    remaining: 26.1s
404:    learn: 0.0070973        total: 17.7s    remaining: 26s
405:    learn: 0.0070822        total: 17.8s    remaining: 26s
406:    learn: 0.0070571        total: 17.8s    remaining: 26s
407:    learn: 0.0070369        total: 17.9s    remaining: 25.9s
408:    learn: 0.0070121        total: 17.9s    remaining: 25.9s
409:    learn: 0.0069964        total: 18s      remaining: 25.9s
410:    learn: 0.0069810        total: 18s      remaining: 25.8s
411:    learn: 0.0069667        total: 18s      remaining: 25.8s
412:    learn: 0.0069506        total: 18.1s    remaining: 25.7s
413:    learn: 0.0069318        total: 18.1s    remaining: 25.7s
414:    learn: 0.0069189        total: 18.2s    remaining: 25.6s
415:    learn: 0.0068975        total: 18.3s    remaining: 25.6s
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416:    learn: 0.0068813        total: 18.3s    remaining: 25.6s
417:    learn: 0.0068632        total: 18.3s    remaining: 25.5s
418:    learn: 0.0068489        total: 18.4s    remaining: 25.5s
419:    learn: 0.0068159        total: 18.4s    remaining: 25.4s
420:    learn: 0.0067973        total: 18.5s    remaining: 25.4s
421:    learn: 0.0067758        total: 18.5s    remaining: 25.4s
422:    learn: 0.0067596        total: 18.6s    remaining: 25.4s
423:    learn: 0.0067429        total: 18.6s    remaining: 25.3s
424:    learn: 0.0067279        total: 18.7s    remaining: 25.3s
425:    learn: 0.0067141        total: 18.7s    remaining: 25.3s
426:    learn: 0.0066853        total: 18.8s    remaining: 25.3s
427:    learn: 0.0066679        total: 18.9s    remaining: 25.2s
428:    learn: 0.0066501        total: 18.9s    remaining: 25.2s
429:    learn: 0.0066348        total: 19s      remaining: 25.1s
430:    learn: 0.0066182        total: 19s      remaining: 25.1s
431:    learn: 0.0066038        total: 19.1s    remaining: 25.1s
432:    learn: 0.0065885        total: 19.1s    remaining: 25s
433:    learn: 0.0065740        total: 19.2s    remaining: 25s
434:    learn: 0.0065584        total: 19.2s    remaining: 24.9s
435:    learn: 0.0065430        total: 19.2s    remaining: 24.9s
436:    learn: 0.0065288        total: 19.3s    remaining: 24.9s
437:    learn: 0.0065189        total: 19.3s    remaining: 24.8s
438:    learn: 0.0065011        total: 19.4s    remaining: 24.7s
439:    learn: 0.0064887        total: 19.4s    remaining: 24.7s
440:    learn: 0.0064783        total: 19.5s    remaining: 24.7s
441:    learn: 0.0064662        total: 19.5s    remaining: 24.6s
442:    learn: 0.0064557        total: 19.5s    remaining: 24.6s
443:    learn: 0.0064409        total: 19.6s    remaining: 24.5s
444:    learn: 0.0064235        total: 19.6s    remaining: 24.5s
445:    learn: 0.0064052        total: 19.7s    remaining: 24.4s
446:    learn: 0.0063916        total: 19.7s    remaining: 24.4s
447:    learn: 0.0063777        total: 19.8s    remaining: 24.4s
448:    learn: 0.0063596        total: 19.8s    remaining: 24.3s
449:    learn: 0.0063480        total: 19.9s    remaining: 24.4s
450:    learn: 0.0063298        total: 20s      remaining: 24.3s
451:    learn: 0.0063108        total: 20s      remaining: 24.2s
452:    learn: 0.0062931        total: 20.1s    remaining: 24.2s
453:    learn: 0.0062741        total: 20.1s    remaining: 24.2s
454:    learn: 0.0062577        total: 20.2s    remaining: 24.1s
455:    learn: 0.0062434        total: 20.2s    remaining: 24.1s
456:    learn: 0.0062294        total: 20.2s    remaining: 24.1s
457:    learn: 0.0062132        total: 20.3s    remaining: 24s
458:    learn: 0.0061982        total: 20.3s    remaining: 24s
459:    learn: 0.0061844        total: 20.4s    remaining: 23.9s
460:    learn: 0.0061671        total: 20.4s    remaining: 23.9s
461:    learn: 0.0061557        total: 20.5s    remaining: 23.8s
462:    learn: 0.0061459        total: 20.5s    remaining: 23.8s
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463:    learn: 0.0061304        total: 20.6s    remaining: 23.8s
464:    learn: 0.0061203        total: 20.6s    remaining: 23.7s
465:    learn: 0.0061009        total: 20.7s    remaining: 23.7s
466:    learn: 0.0060887        total: 20.7s    remaining: 23.6s
467:    learn: 0.0060740        total: 20.7s    remaining: 23.6s
468:    learn: 0.0060616        total: 20.8s    remaining: 23.5s
469:    learn: 0.0060492        total: 20.8s    remaining: 23.5s
470:    learn: 0.0060307        total: 20.9s    remaining: 23.4s
471:    learn: 0.0060077        total: 20.9s    remaining: 23.4s
472:    learn: 0.0059931        total: 21s      remaining: 23.4s
473:    learn: 0.0059825        total: 21.1s    remaining: 23.4s
474:    learn: 0.0059706        total: 21.1s    remaining: 23.3s
475:    learn: 0.0059589        total: 21.1s    remaining: 23.3s
476:    learn: 0.0059440        total: 21.2s    remaining: 23.2s
477:    learn: 0.0059328        total: 21.2s    remaining: 23.2s
478:    learn: 0.0059205        total: 21.3s    remaining: 23.1s
479:    learn: 0.0059119        total: 21.3s    remaining: 23.1s
480:    learn: 0.0059004        total: 21.4s    remaining: 23s
481:    learn: 0.0058901        total: 21.4s    remaining: 23s
482:    learn: 0.0058775        total: 21.4s    remaining: 22.9s
483:    learn: 0.0058664        total: 21.5s    remaining: 22.9s
484:    learn: 0.0058576        total: 21.5s    remaining: 22.9s
485:    learn: 0.0058472        total: 21.6s    remaining: 22.8s
486:    learn: 0.0058404        total: 21.6s    remaining: 22.8s
487:    learn: 0.0058299        total: 21.7s    remaining: 22.8s
488:    learn: 0.0058160        total: 21.7s    remaining: 22.7s
489:    learn: 0.0058060        total: 21.8s    remaining: 22.7s
490:    learn: 0.0057954        total: 21.8s    remaining: 22.6s
491:    learn: 0.0057868        total: 21.9s    remaining: 22.6s
492:    learn: 0.0057726        total: 21.9s    remaining: 22.6s
493:    learn: 0.0057623        total: 22s      remaining: 22.5s
494:    learn: 0.0057466        total: 22s      remaining: 22.5s
495:    learn: 0.0057298        total: 22.1s    remaining: 22.4s
496:    learn: 0.0057168        total: 22.1s    remaining: 22.4s
497:    learn: 0.0057039        total: 22.2s    remaining: 22.3s
498:    learn: 0.0056924        total: 22.2s    remaining: 22.3s
499:    learn: 0.0056849        total: 22.3s    remaining: 22.3s
500:    learn: 0.0056748        total: 22.4s    remaining: 22.3s
501:    learn: 0.0056658        total: 22.4s    remaining: 22.2s
502:    learn: 0.0056559        total: 22.4s    remaining: 22.2s
503:    learn: 0.0056413        total: 22.5s    remaining: 22.1s
504:    learn: 0.0056290        total: 22.5s    remaining: 22.1s
505:    learn: 0.0056187        total: 22.6s    remaining: 22.1s
506:    learn: 0.0056055        total: 22.6s    remaining: 22s
507:    learn: 0.0055973        total: 22.7s    remaining: 22s
508:    learn: 0.0055816        total: 22.7s    remaining: 21.9s
509:    learn: 0.0055714        total: 22.8s    remaining: 21.9s
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510:    learn: 0.0055583        total: 22.9s    remaining: 21.9s
511:    learn: 0.0055500        total: 22.9s    remaining: 21.8s
512:    learn: 0.0055342        total: 22.9s    remaining: 21.8s
513:    learn: 0.0055265        total: 23s      remaining: 21.8s
514:    learn: 0.0055140        total: 23.1s    remaining: 21.7s
515:    learn: 0.0055029        total: 23.1s    remaining: 21.7s
516:    learn: 0.0054901        total: 23.1s    remaining: 21.6s
517:    learn: 0.0054764        total: 23.2s    remaining: 21.6s
518:    learn: 0.0054677        total: 23.2s    remaining: 21.5s
519:    learn: 0.0054586        total: 23.3s    remaining: 21.5s
520:    learn: 0.0054509        total: 23.3s    remaining: 21.5s
521:    learn: 0.0054430        total: 23.4s    remaining: 21.4s
522:    learn: 0.0054337        total: 23.4s    remaining: 21.4s
523:    learn: 0.0054224        total: 23.5s    remaining: 21.3s
524:    learn: 0.0054119        total: 23.5s    remaining: 21.3s
525:    learn: 0.0053962        total: 23.6s    remaining: 21.2s
526:    learn: 0.0053817        total: 23.6s    remaining: 21.2s
527:    learn: 0.0053749        total: 23.7s    remaining: 21.2s
528:    learn: 0.0053620        total: 23.7s    remaining: 21.1s
529:    learn: 0.0053491        total: 23.8s    remaining: 21.1s
530:    learn: 0.0053404        total: 23.9s    remaining: 21.1s
531:    learn: 0.0053275        total: 23.9s    remaining: 21s
532:    learn: 0.0053120        total: 24s      remaining: 21s
533:    learn: 0.0053017        total: 24s      remaining: 20.9s
534:    learn: 0.0052890        total: 24.1s    remaining: 20.9s
535:    learn: 0.0052780        total: 24.1s    remaining: 20.9s
536:    learn: 0.0052697        total: 24.2s    remaining: 20.9s
537:    learn: 0.0052624        total: 24.2s    remaining: 20.8s
538:    learn: 0.0052527        total: 24.3s    remaining: 20.8s
539:    learn: 0.0052448        total: 24.3s    remaining: 20.7s
540:    learn: 0.0052342        total: 24.4s    remaining: 20.7s
541:    learn: 0.0052229        total: 24.4s    remaining: 20.6s
542:    learn: 0.0052104        total: 24.5s    remaining: 20.6s
543:    learn: 0.0051986        total: 24.5s    remaining: 20.5s
544:    learn: 0.0051864        total: 24.5s    remaining: 20.5s
545:    learn: 0.0051749        total: 24.6s    remaining: 20.4s
546:    learn: 0.0051672        total: 24.6s    remaining: 20.4s
547:    learn: 0.0051573        total: 24.7s    remaining: 20.4s
548:    learn: 0.0051473        total: 24.7s    remaining: 20.3s
549:    learn: 0.0051390        total: 24.8s    remaining: 20.3s
550:    learn: 0.0051301        total: 24.9s    remaining: 20.3s
551:    learn: 0.0051215        total: 24.9s    remaining: 20.2s
552:    learn: 0.0051142        total: 24.9s    remaining: 20.2s
553:    learn: 0.0051074        total: 25s      remaining: 20.2s
554:    learn: 0.0051009        total: 25.1s    remaining: 20.1s
555:    learn: 0.0050917        total: 25.1s    remaining: 20.1s
556:    learn: 0.0050854        total: 25.2s    remaining: 20s
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557:    learn: 0.0050785        total: 25.3s    remaining: 20s
558:    learn: 0.0050663        total: 25.3s    remaining: 20s
559:    learn: 0.0050590        total: 25.4s    remaining: 19.9s
560:    learn: 0.0050488        total: 25.4s    remaining: 19.9s
561:    learn: 0.0050395        total: 25.5s    remaining: 19.8s
562:    learn: 0.0050315        total: 25.5s    remaining: 19.8s
563:    learn: 0.0050264        total: 25.5s    remaining: 19.7s
564:    learn: 0.0050192        total: 25.6s    remaining: 19.7s
565:    learn: 0.0050109        total: 25.6s    remaining: 19.7s
566:    learn: 0.0050030        total: 25.7s    remaining: 19.6s
567:    learn: 0.0049900        total: 25.7s    remaining: 19.6s
568:    learn: 0.0049817        total: 25.8s    remaining: 19.5s
569:    learn: 0.0049750        total: 25.8s    remaining: 19.5s
570:    learn: 0.0049628        total: 25.8s    remaining: 19.4s
571:    learn: 0.0049568        total: 25.9s    remaining: 19.3s
572:    learn: 0.0049443        total: 25.9s    remaining: 19.3s
573:    learn: 0.0049360        total: 25.9s    remaining: 19.3s
574:    learn: 0.0049266        total: 26s      remaining: 19.2s
575:    learn: 0.0049197        total: 26s      remaining: 19.2s
576:    learn: 0.0049122        total: 26.1s    remaining: 19.1s
577:    learn: 0.0049045        total: 26.2s    remaining: 19.1s
578:    learn: 0.0048966        total: 26.2s    remaining: 19s
579:    learn: 0.0048891        total: 26.2s    remaining: 19s
580:    learn: 0.0048752        total: 26.3s    remaining: 18.9s
581:    learn: 0.0048665        total: 26.3s    remaining: 18.9s
582:    learn: 0.0048592        total: 26.4s    remaining: 18.9s
583:    learn: 0.0048517        total: 26.4s    remaining: 18.8s
584:    learn: 0.0048390        total: 26.5s    remaining: 18.8s
585:    learn: 0.0048317        total: 26.5s    remaining: 18.7s
586:    learn: 0.0048252        total: 26.6s    remaining: 18.7s
587:    learn: 0.0048161        total: 26.6s    remaining: 18.6s
588:    learn: 0.0048028        total: 26.6s    remaining: 18.6s
589:    learn: 0.0047953        total: 26.7s    remaining: 18.5s
590:    learn: 0.0047866        total: 26.7s    remaining: 18.5s
591:    learn: 0.0047772        total: 26.8s    remaining: 18.5s
592:    learn: 0.0047645        total: 26.8s    remaining: 18.4s
593:    learn: 0.0047582        total: 26.9s    remaining: 18.4s
594:    learn: 0.0047518        total: 26.9s    remaining: 18.3s
595:    learn: 0.0047431        total: 26.9s    remaining: 18.3s
596:    learn: 0.0047340        total: 27s      remaining: 18.2s
597:    learn: 0.0047242        total: 27s      remaining: 18.2s
598:    learn: 0.0047176        total: 27.1s    remaining: 18.1s
599:    learn: 0.0047099        total: 27.2s    remaining: 18.1s
600:    learn: 0.0047037        total: 27.2s    remaining: 18.1s
601:    learn: 0.0046956        total: 27.2s    remaining: 18s
602:    learn: 0.0046880        total: 27.3s    remaining: 18s
603:    learn: 0.0046753        total: 27.3s    remaining: 17.9s
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604:    learn: 0.0046657        total: 27.4s    remaining: 17.9s
605:    learn: 0.0046553        total: 27.4s    remaining: 17.8s
606:    learn: 0.0046484        total: 27.4s    remaining: 17.8s
607:    learn: 0.0046389        total: 27.5s    remaining: 17.7s
608:    learn: 0.0046316        total: 27.5s    remaining: 17.7s
609:    learn: 0.0046240        total: 27.6s    remaining: 17.6s
610:    learn: 0.0046149        total: 27.6s    remaining: 17.6s
611:    learn: 0.0046076        total: 27.7s    remaining: 17.5s
612:    learn: 0.0046014        total: 27.7s    remaining: 17.5s
613:    learn: 0.0045959        total: 27.8s    remaining: 17.5s
614:    learn: 0.0045877        total: 27.8s    remaining: 17.4s
615:    learn: 0.0045805        total: 27.8s    remaining: 17.4s
616:    learn: 0.0045727        total: 27.9s    remaining: 17.3s
617:    learn: 0.0045628        total: 27.9s    remaining: 17.3s
618:    learn: 0.0045575        total: 28s      remaining: 17.2s
619:    learn: 0.0045464        total: 28s      remaining: 17.2s
620:    learn: 0.0045404        total: 28.1s    remaining: 17.1s
621:    learn: 0.0045341        total: 28.1s    remaining: 17.1s
622:    learn: 0.0045269        total: 28.2s    remaining: 17s
623:    learn: 0.0045140        total: 28.2s    remaining: 17s
624:    learn: 0.0045095        total: 28.3s    remaining: 16.9s
625:    learn: 0.0044999        total: 28.3s    remaining: 16.9s
626:    learn: 0.0044926        total: 28.3s    remaining: 16.9s
627:    learn: 0.0044878        total: 28.4s    remaining: 16.8s
628:    learn: 0.0044834        total: 28.4s    remaining: 16.8s
629:    learn: 0.0044787        total: 28.5s    remaining: 16.7s
630:    learn: 0.0044735        total: 28.5s    remaining: 16.7s
631:    learn: 0.0044648        total: 28.6s    remaining: 16.6s
632:    learn: 0.0044553        total: 28.6s    remaining: 16.6s
633:    learn: 0.0044496        total: 28.7s    remaining: 16.6s
634:    learn: 0.0044412        total: 28.7s    remaining: 16.5s
635:    learn: 0.0044347        total: 28.7s    remaining: 16.4s
636:    learn: 0.0044304        total: 28.8s    remaining: 16.4s
637:    learn: 0.0044260        total: 28.8s    remaining: 16.4s
638:    learn: 0.0044206        total: 28.9s    remaining: 16.3s
639:    learn: 0.0044129        total: 28.9s    remaining: 16.3s
640:    learn: 0.0044070        total: 28.9s    remaining: 16.2s
641:    learn: 0.0044013        total: 29s      remaining: 16.2s
642:    learn: 0.0043951        total: 29s      remaining: 16.1s
643:    learn: 0.0043895        total: 29.1s    remaining: 16.1s
644:    learn: 0.0043842        total: 29.1s    remaining: 16s
645:    learn: 0.0043766        total: 29.2s    remaining: 16s
646:    learn: 0.0043706        total: 29.2s    remaining: 16s
647:    learn: 0.0043626        total: 29.3s    remaining: 15.9s
648:    learn: 0.0043539        total: 29.3s    remaining: 15.9s
649:    learn: 0.0043463        total: 29.4s    remaining: 15.8s
650:    learn: 0.0043368        total: 29.4s    remaining: 15.8s
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651:    learn: 0.0043265        total: 29.4s    remaining: 15.7s
652:    learn: 0.0043166        total: 29.5s    remaining: 15.7s
653:    learn: 0.0043089        total: 29.6s    remaining: 15.6s
654:    learn: 0.0043034        total: 29.6s    remaining: 15.6s
655:    learn: 0.0042986        total: 29.6s    remaining: 15.5s
656:    learn: 0.0042918        total: 29.7s    remaining: 15.5s
657:    learn: 0.0042872        total: 29.7s    remaining: 15.5s
658:    learn: 0.0042802        total: 29.8s    remaining: 15.4s
659:    learn: 0.0042709        total: 29.8s    remaining: 15.4s
660:    learn: 0.0042635        total: 29.9s    remaining: 15.3s
661:    learn: 0.0042582        total: 29.9s    remaining: 15.3s
662:    learn: 0.0042533        total: 30s      remaining: 15.2s
663:    learn: 0.0042474        total: 30s      remaining: 15.2s
664:    learn: 0.0042365        total: 30.1s    remaining: 15.2s
665:    learn: 0.0042310        total: 30.1s    remaining: 15.1s
666:    learn: 0.0042261        total: 30.2s    remaining: 15.1s
667:    learn: 0.0042187        total: 30.2s    remaining: 15s
668:    learn: 0.0042125        total: 30.3s    remaining: 15s
669:    learn: 0.0042071        total: 30.4s    remaining: 14.9s
670:    learn: 0.0042007        total: 30.4s    remaining: 14.9s
671:    learn: 0.0041947        total: 30.5s    remaining: 14.9s
672:    learn: 0.0041899        total: 30.5s    remaining: 14.8s
673:    learn: 0.0041825        total: 30.5s    remaining: 14.8s
674:    learn: 0.0041766        total: 30.6s    remaining: 14.7s
675:    learn: 0.0041724        total: 30.7s    remaining: 14.7s
676:    learn: 0.0041618        total: 30.7s    remaining: 14.6s
677:    learn: 0.0041579        total: 30.7s    remaining: 14.6s
678:    learn: 0.0041513        total: 30.8s    remaining: 14.6s
679:    learn: 0.0041453        total: 30.8s    remaining: 14.5s
680:    learn: 0.0041393        total: 30.9s    remaining: 14.5s
681:    learn: 0.0041345        total: 30.9s    remaining: 14.4s
682:    learn: 0.0041290        total: 31s      remaining: 14.4s
683:    learn: 0.0041196        total: 31s      remaining: 14.3s
684:    learn: 0.0041132        total: 31.1s    remaining: 14.3s
685:    learn: 0.0041020        total: 31.1s    remaining: 14.2s
686:    learn: 0.0040971        total: 31.2s    remaining: 14.2s
687:    learn: 0.0040885        total: 31.2s    remaining: 14.1s
688:    learn: 0.0040835        total: 31.2s    remaining: 14.1s
689:    learn: 0.0040788        total: 31.3s    remaining: 14.1s
690:    learn: 0.0040715        total: 31.4s    remaining: 14s
691:    learn: 0.0040640        total: 31.4s    remaining: 14s
692:    learn: 0.0040558        total: 31.4s    remaining: 13.9s
693:    learn: 0.0040522        total: 31.5s    remaining: 13.9s
694:    learn: 0.0040478        total: 31.5s    remaining: 13.8s
695:    learn: 0.0040391        total: 31.6s    remaining: 13.8s
696:    learn: 0.0040349        total: 31.6s    remaining: 13.7s
697:    learn: 0.0040295        total: 31.7s    remaining: 13.7s
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698:    learn: 0.0040204        total: 31.7s    remaining: 13.7s
699:    learn: 0.0040157        total: 31.8s    remaining: 13.6s
700:    learn: 0.0040079        total: 31.8s    remaining: 13.6s
701:    learn: 0.0040006        total: 31.9s    remaining: 13.5s
702:    learn: 0.0039955        total: 31.9s    remaining: 13.5s
703:    learn: 0.0039900        total: 32s      remaining: 13.4s
704:    learn: 0.0039856        total: 32s      remaining: 13.4s
705:    learn: 0.0039791        total: 32.1s    remaining: 13.4s
706:    learn: 0.0039735        total: 32.1s    remaining: 13.3s
707:    learn: 0.0039625        total: 32.2s    remaining: 13.3s
708:    learn: 0.0039563        total: 32.2s    remaining: 13.2s
709:    learn: 0.0039496        total: 32.3s    remaining: 13.2s
710:    learn: 0.0039449        total: 32.3s    remaining: 13.1s
711:    learn: 0.0039394        total: 32.4s    remaining: 13.1s
712:    learn: 0.0039345        total: 32.4s    remaining: 13.1s
713:    learn: 0.0039277        total: 32.5s    remaining: 13s
714:    learn: 0.0039209        total: 32.5s    remaining: 13s
715:    learn: 0.0039148        total: 32.6s    remaining: 12.9s
716:    learn: 0.0039066        total: 32.6s    remaining: 12.9s
717:    learn: 0.0038986        total: 32.6s    remaining: 12.8s
718:    learn: 0.0038917        total: 32.7s    remaining: 12.8s
719:    learn: 0.0038874        total: 32.7s    remaining: 12.7s
720:    learn: 0.0038825        total: 32.8s    remaining: 12.7s
721:    learn: 0.0038763        total: 32.8s    remaining: 12.6s
722:    learn: 0.0038716        total: 32.9s    remaining: 12.6s
723:    learn: 0.0038659        total: 32.9s    remaining: 12.5s
724:    learn: 0.0038589        total: 33s      remaining: 12.5s
725:    learn: 0.0038546        total: 33s      remaining: 12.5s
726:    learn: 0.0038498        total: 33.1s    remaining: 12.4s
727:    learn: 0.0038442        total: 33.1s    remaining: 12.4s
728:    learn: 0.0038405        total: 33.2s    remaining: 12.3s
729:    learn: 0.0038343        total: 33.3s    remaining: 12.3s
730:    learn: 0.0038278        total: 33.3s    remaining: 12.3s
731:    learn: 0.0038225        total: 33.4s    remaining: 12.2s
732:    learn: 0.0038176        total: 33.4s    remaining: 12.2s
733:    learn: 0.0038121        total: 33.5s    remaining: 12.1s
734:    learn: 0.0038080        total: 33.5s    remaining: 12.1s
735:    learn: 0.0038024        total: 33.6s    remaining: 12s
736:    learn: 0.0037971        total: 33.6s    remaining: 12s
737:    learn: 0.0037926        total: 33.6s    remaining: 11.9s
738:    learn: 0.0037891        total: 33.7s    remaining: 11.9s
739:    learn: 0.0037799        total: 33.8s    remaining: 11.9s
740:    learn: 0.0037735        total: 33.8s    remaining: 11.8s
741:    learn: 0.0037672        total: 33.8s    remaining: 11.8s
742:    learn: 0.0037629        total: 33.9s    remaining: 11.7s
743:    learn: 0.0037582        total: 33.9s    remaining: 11.7s
744:    learn: 0.0037533        total: 34s      remaining: 11.6s
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745:    learn: 0.0037479        total: 34s      remaining: 11.6s
746:    learn: 0.0037428        total: 34s      remaining: 11.5s
747:    learn: 0.0037392        total: 34.1s    remaining: 11.5s
748:    learn: 0.0037336        total: 34.2s    remaining: 11.5s
749:    learn: 0.0037290        total: 34.2s    remaining: 11.4s
750:    learn: 0.0037236        total: 34.2s    remaining: 11.4s
751:    learn: 0.0037178        total: 34.3s    remaining: 11.3s
752:    learn: 0.0037126        total: 34.4s    remaining: 11.3s
753:    learn: 0.0037078        total: 34.4s    remaining: 11.2s
754:    learn: 0.0037027        total: 34.5s    remaining: 11.2s
755:    learn: 0.0036985        total: 34.5s    remaining: 11.1s
756:    learn: 0.0036951        total: 34.6s    remaining: 11.1s
757:    learn: 0.0036924        total: 34.6s    remaining: 11.1s
758:    learn: 0.0036882        total: 34.7s    remaining: 11s
759:    learn: 0.0036824        total: 34.7s    remaining: 11s
760:    learn: 0.0036779        total: 34.8s    remaining: 10.9s
761:    learn: 0.0036744        total: 34.9s    remaining: 10.9s
762:    learn: 0.0036692        total: 34.9s    remaining: 10.8s
763:    learn: 0.0036637        total: 34.9s    remaining: 10.8s
764:    learn: 0.0036593        total: 35s      remaining: 10.7s
765:    learn: 0.0036559        total: 35s      remaining: 10.7s
766:    learn: 0.0036509        total: 35.1s    remaining: 10.7s
767:    learn: 0.0036470        total: 35.1s    remaining: 10.6s
768:    learn: 0.0036416        total: 35.2s    remaining: 10.6s
769:    learn: 0.0036377        total: 35.3s    remaining: 10.5s
770:    learn: 0.0036331        total: 35.3s    remaining: 10.5s
771:    learn: 0.0036294        total: 35.4s    remaining: 10.5s
772:    learn: 0.0036259        total: 35.4s    remaining: 10.4s
773:    learn: 0.0036215        total: 35.5s    remaining: 10.4s
774:    learn: 0.0036169        total: 35.5s    remaining: 10.3s
775:    learn: 0.0036128        total: 35.6s    remaining: 10.3s
776:    learn: 0.0036088        total: 35.6s    remaining: 10.2s
777:    learn: 0.0036042        total: 35.7s    remaining: 10.2s
778:    learn: 0.0035995        total: 35.7s    remaining: 10.1s
779:    learn: 0.0035952        total: 35.8s    remaining: 10.1s
780:    learn: 0.0035904        total: 35.8s    remaining: 10s
781:    learn: 0.0035866        total: 35.9s    remaining: 9.99s
782:    learn: 0.0035805        total: 35.9s    remaining: 9.95s
783:    learn: 0.0035755        total: 35.9s    remaining: 9.9s
784:    learn: 0.0035703        total: 36s      remaining: 9.85s
785:    learn: 0.0035654        total: 36s      remaining: 9.81s
786:    learn: 0.0035600        total: 36.1s    remaining: 9.76s
787:    learn: 0.0035553        total: 36.1s    remaining: 9.72s
788:    learn: 0.0035515        total: 36.2s    remaining: 9.68s
789:    learn: 0.0035467        total: 36.3s    remaining: 9.64s
790:    learn: 0.0035403        total: 36.3s    remaining: 9.59s
791:    learn: 0.0035360        total: 36.4s    remaining: 9.55s
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792:    learn: 0.0035335        total: 36.4s    remaining: 9.5s
793:    learn: 0.0035261        total: 36.4s    remaining: 9.45s
794:    learn: 0.0035210        total: 36.5s    remaining: 9.4s
795:    learn: 0.0035168        total: 36.5s    remaining: 9.36s
796:    learn: 0.0035126        total: 36.6s    remaining: 9.31s
797:    learn: 0.0035080        total: 36.6s    remaining: 9.27s
798:    learn: 0.0035031        total: 36.7s    remaining: 9.22s
799:    learn: 0.0034990        total: 36.7s    remaining: 9.17s
800:    learn: 0.0034957        total: 36.7s    remaining: 9.13s
801:    learn: 0.0034910        total: 36.8s    remaining: 9.08s
802:    learn: 0.0034854        total: 36.8s    remaining: 9.03s
803:    learn: 0.0034818        total: 36.9s    remaining: 8.99s
804:    learn: 0.0034781        total: 36.9s    remaining: 8.95s
805:    learn: 0.0034735        total: 37s      remaining: 8.9s
806:    learn: 0.0034701        total: 37s      remaining: 8.86s
807:    learn: 0.0034670        total: 37.1s    remaining: 8.81s
808:    learn: 0.0034619        total: 37.1s    remaining: 8.77s
809:    learn: 0.0034551        total: 37.2s    remaining: 8.72s
810:    learn: 0.0034505        total: 37.3s    remaining: 8.68s
811:    learn: 0.0034479        total: 37.3s    remaining: 8.63s
812:    learn: 0.0034443        total: 37.3s    remaining: 8.59s
813:    learn: 0.0034399        total: 37.4s    remaining: 8.54s
814:    learn: 0.0034365        total: 37.4s    remaining: 8.5s
815:    learn: 0.0034322        total: 37.5s    remaining: 8.45s
816:    learn: 0.0034292        total: 37.5s    remaining: 8.4s
817:    learn: 0.0034250        total: 37.6s    remaining: 8.36s
818:    learn: 0.0034201        total: 37.6s    remaining: 8.31s
819:    learn: 0.0034154        total: 37.7s    remaining: 8.27s
820:    learn: 0.0034108        total: 37.7s    remaining: 8.22s
821:    learn: 0.0034073        total: 37.8s    remaining: 8.18s
822:    learn: 0.0034043        total: 37.8s    remaining: 8.14s
823:    learn: 0.0034001        total: 37.9s    remaining: 8.09s
824:    learn: 0.0033962        total: 37.9s    remaining: 8.04s
825:    learn: 0.0033928        total: 38s      remaining: 8s
826:    learn: 0.0033885        total: 38s      remaining: 7.95s
827:    learn: 0.0033842        total: 38s      remaining: 7.9s
828:    learn: 0.0033801        total: 38.1s    remaining: 7.86s
829:    learn: 0.0033767        total: 38.2s    remaining: 7.81s
830:    learn: 0.0033730        total: 38.2s    remaining: 7.76s
831:    learn: 0.0033700        total: 38.2s    remaining: 7.72s
832:    learn: 0.0033672        total: 38.3s    remaining: 7.68s
833:    learn: 0.0033646        total: 38.3s    remaining: 7.63s
834:    learn: 0.0033610        total: 38.4s    remaining: 7.58s
835:    learn: 0.0033558        total: 38.4s    remaining: 7.54s
836:    learn: 0.0033530        total: 38.5s    remaining: 7.5s
837:    learn: 0.0033497        total: 38.5s    remaining: 7.45s
838:    learn: 0.0033464        total: 38.6s    remaining: 7.4s
```

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839:    learn: 0.0033429        total: 38.6s    remaining: 7.36s
840:    learn: 0.0033383        total: 38.7s    remaining: 7.31s
841:    learn: 0.0033345        total: 38.7s    remaining: 7.26s
842:    learn: 0.0033298        total: 38.7s    remaining: 7.21s
843:    learn: 0.0033271        total: 38.8s    remaining: 7.17s
844:    learn: 0.0033233        total: 38.8s    remaining: 7.12s
845:    learn: 0.0033171        total: 38.9s    remaining: 7.07s
846:    learn: 0.0033144        total: 38.9s    remaining: 7.03s
847:    learn: 0.0033104        total: 38.9s    remaining: 6.98s
848:    learn: 0.0033063        total: 39s      remaining: 6.93s
849:    learn: 0.0033028        total: 39s      remaining: 6.89s
850:    learn: 0.0032997        total: 39.1s    remaining: 6.84s
851:    learn: 0.0032957        total: 39.1s    remaining: 6.8s
852:    learn: 0.0032922        total: 39.2s    remaining: 6.75s
853:    learn: 0.0032879        total: 39.2s    remaining: 6.71s
854:    learn: 0.0032850        total: 39.3s    remaining: 6.67s
855:    learn: 0.0032813        total: 39.3s    remaining: 6.62s
856:    learn: 0.0032776        total: 39.4s    remaining: 6.57s
857:    learn: 0.0032744        total: 39.4s    remaining: 6.53s
858:    learn: 0.0032696        total: 39.5s    remaining: 6.49s
859:    learn: 0.0032663        total: 39.5s    remaining: 6.44s
860:    learn: 0.0032626        total: 39.6s    remaining: 6.39s
861:    learn: 0.0032596        total: 39.6s    remaining: 6.34s
862:    learn: 0.0032553        total: 39.7s    remaining: 6.3s
863:    learn: 0.0032513        total: 39.7s    remaining: 6.25s
864:    learn: 0.0032483        total: 39.8s    remaining: 6.21s
865:    learn: 0.0032444        total: 39.8s    remaining: 6.16s
866:    learn: 0.0032412        total: 39.9s    remaining: 6.11s
867:    learn: 0.0032364        total: 39.9s    remaining: 6.07s
868:    learn: 0.0032317        total: 40s      remaining: 6.02s
869:    learn: 0.0032277        total: 40s      remaining: 5.97s
870:    learn: 0.0032240        total: 40s      remaining: 5.93s
871:    learn: 0.0032206        total: 40.1s    remaining: 5.88s
872:    learn: 0.0032180        total: 40.2s    remaining: 5.84s
873:    learn: 0.0032143        total: 40.2s    remaining: 5.79s
874:    learn: 0.0032108        total: 40.3s    remaining: 5.75s
875:    learn: 0.0032071        total: 40.3s    remaining: 5.71s
876:    learn: 0.0032026        total: 40.4s    remaining: 5.66s
877:    learn: 0.0031986        total: 40.4s    remaining: 5.62s
878:    learn: 0.0031959        total: 40.5s    remaining: 5.57s
879:    learn: 0.0031921        total: 40.6s    remaining: 5.53s
880:    learn: 0.0031882        total: 40.6s    remaining: 5.48s
881:    learn: 0.0031850        total: 40.6s    remaining: 5.44s
882:    learn: 0.0031786        total: 40.7s    remaining: 5.39s
883:    learn: 0.0031763        total: 40.8s    remaining: 5.35s
884:    learn: 0.0031733        total: 40.8s    remaining: 5.3s
885:    learn: 0.0031685        total: 40.8s    remaining: 5.25s
```

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886:    learn: 0.0031646        total: 40.9s    remaining: 5.21s
887:    learn: 0.0031604        total: 41s      remaining: 5.17s
888:    learn: 0.0031565        total: 41s      remaining: 5.12s
889:    learn: 0.0031536        total: 41.1s    remaining: 5.08s
890:    learn: 0.0031511        total: 41.1s    remaining: 5.03s
891:    learn: 0.0031460        total: 41.2s    remaining: 4.98s
892:    learn: 0.0031411        total: 41.2s    remaining: 4.94s
893:    learn: 0.0031370        total: 41.2s    remaining: 4.89s
894:    learn: 0.0031339        total: 41.3s    remaining: 4.84s
895:    learn: 0.0031321        total: 41.4s    remaining: 4.8s
896:    learn: 0.0031284        total: 41.4s    remaining: 4.75s
897:    learn: 0.0031246        total: 41.4s    remaining: 4.71s
898:    learn: 0.0031213        total: 41.5s    remaining: 4.66s
899:    learn: 0.0031178        total: 41.5s    remaining: 4.61s
900:    learn: 0.0031123        total: 41.6s    remaining: 4.57s
901:    learn: 0.0031078        total: 41.6s    remaining: 4.52s
902:    learn: 0.0031044        total: 41.7s    remaining: 4.47s
903:    learn: 0.0031007        total: 41.7s    remaining: 4.43s
904:    learn: 0.0030981        total: 41.8s    remaining: 4.38s
905:    learn: 0.0030921        total: 41.8s    remaining: 4.34s
906:    learn: 0.0030881        total: 41.9s    remaining: 4.29s
907:    learn: 0.0030838        total: 41.9s    remaining: 4.25s
908:    learn: 0.0030812        total: 42s      remaining: 4.2s
909:    learn: 0.0030765        total: 42s      remaining: 4.15s
910:    learn: 0.0030732        total: 42s      remaining: 4.11s
911:    learn: 0.0030696        total: 42.1s    remaining: 4.06s
912:    learn: 0.0030670        total: 42.1s    remaining: 4.01s
913:    learn: 0.0030642        total: 42.2s    remaining: 3.97s
914:    learn: 0.0030614        total: 42.2s    remaining: 3.92s
915:    learn: 0.0030589        total: 42.3s    remaining: 3.88s
916:    learn: 0.0030563        total: 42.3s    remaining: 3.83s
917:    learn: 0.0030539        total: 42.4s    remaining: 3.79s
918:    learn: 0.0030510        total: 42.5s    remaining: 3.74s
919:    learn: 0.0030466        total: 42.5s    remaining: 3.69s
920:    learn: 0.0030421        total: 42.6s    remaining: 3.65s
921:    learn: 0.0030386        total: 42.6s    remaining: 3.6s
922:    learn: 0.0030351        total: 42.6s    remaining: 3.56s
923:    learn: 0.0030323        total: 42.7s    remaining: 3.51s
924:    learn: 0.0030300        total: 42.7s    remaining: 3.46s
925:    learn: 0.0030275        total: 42.8s    remaining: 3.42s
926:    learn: 0.0030250        total: 42.8s    remaining: 3.37s
927:    learn: 0.0030219        total: 42.9s    remaining: 3.33s
928:    learn: 0.0030185        total: 42.9s    remaining: 3.28s
929:    learn: 0.0030131        total: 43s      remaining: 3.23s
930:    learn: 0.0030095        total: 43s      remaining: 3.19s
931:    learn: 0.0030023        total: 43.1s    remaining: 3.14s
932:    learn: 0.0029998        total: 43.1s    remaining: 3.1s
```

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933:    learn: 0.0029971        total: 43.1s    remaining: 3.05s
934:    learn: 0.0029942        total: 43.2s    remaining: 3s
935:    learn: 0.0029921        total: 43.3s    remaining: 2.96s
936:    learn: 0.0029900        total: 43.3s    remaining: 2.91s
937:    learn: 0.0029864        total: 43.4s    remaining: 2.87s
938:    learn: 0.0029840        total: 43.4s    remaining: 2.82s
939:    learn: 0.0029812        total: 43.5s    remaining: 2.78s
940:    learn: 0.0029782        total: 43.6s    remaining: 2.73s
941:    learn: 0.0029711        total: 43.6s    remaining: 2.68s
942:    learn: 0.0029679        total: 43.6s    remaining: 2.64s
943:    learn: 0.0029641        total: 43.7s    remaining: 2.59s
944:    learn: 0.0029611        total: 43.8s    remaining: 2.55s
945:    learn: 0.0029575        total: 43.8s    remaining: 2.5s
946:    learn: 0.0029549        total: 43.9s    remaining: 2.45s
947:    learn: 0.0029527        total: 43.9s    remaining: 2.41s
948:    learn: 0.0029489        total: 44s      remaining: 2.36s
949:    learn: 0.0029461        total: 44s      remaining: 2.32s
950:    learn: 0.0029432        total: 44.1s    remaining: 2.27s
951:    learn: 0.0029408        total: 44.1s    remaining: 2.22s
952:    learn: 0.0029369        total: 44.2s    remaining: 2.18s
953:    learn: 0.0029333        total: 44.2s    remaining: 2.13s
954:    learn: 0.0029304        total: 44.3s    remaining: 2.08s
955:    learn: 0.0029279        total: 44.3s    remaining: 2.04s
956:    learn: 0.0029252        total: 44.4s    remaining: 1.99s
957:    learn: 0.0029222        total: 44.4s    remaining: 1.95s
958:    learn: 0.0029188        total: 44.5s    remaining: 1.9s
959:    learn: 0.0029148        total: 44.5s    remaining: 1.85s
960:    learn: 0.0029089        total: 44.6s    remaining: 1.81s
961:    learn: 0.0029059        total: 44.6s    remaining: 1.76s
962:    learn: 0.0029036        total: 44.7s    remaining: 1.72s
963:    learn: 0.0028999        total: 44.7s    remaining: 1.67s
964:    learn: 0.0028969        total: 44.7s    remaining: 1.62s
965:    learn: 0.0028926        total: 44.8s    remaining: 1.58s
966:    learn: 0.0028893        total: 44.8s    remaining: 1.53s
967:    learn: 0.0028851        total: 44.9s    remaining: 1.48s
968:    learn: 0.0028833        total: 44.9s    remaining: 1.44s
969:    learn: 0.0028792        total: 45s      remaining: 1.39s
970:    learn: 0.0028763        total: 45.1s    remaining: 1.34s
971:    learn: 0.0028736        total: 45.1s    remaining: 1.3s
972:    learn: 0.0028704        total: 45.1s    remaining: 1.25s
973:    learn: 0.0028677        total: 45.2s    remaining: 1.21s
974:    learn: 0.0028644        total: 45.2s    remaining: 1.16s
975:    learn: 0.0028624        total: 45.3s    remaining: 1.11s
976:    learn: 0.0028599        total: 45.3s    remaining: 1.07s
977:    learn: 0.0028560        total: 45.4s    remaining: 1.02s
978:    learn: 0.0028533        total: 45.4s    remaining: 974ms
979:    learn: 0.0028502        total: 45.5s    remaining: 928ms
```

```
980:    learn: 0.0028473        total: 45.5s    remaining: 882ms
981:    learn: 0.0028432        total: 45.6s    remaining: 836ms
982:    learn: 0.0028381        total: 45.6s    remaining: 789ms
983:    learn: 0.0028361        total: 45.7s    remaining: 743ms
984:    learn: 0.0028333        total: 45.7s    remaining: 696ms
985:    learn: 0.0028309        total: 45.8s    remaining: 650ms
986:    learn: 0.0028289        total: 45.8s    remaining: 604ms
987:    learn: 0.0028262        total: 45.9s    remaining: 557ms
988:    learn: 0.0028231        total: 45.9s    remaining: 511ms
989:    learn: 0.0028193        total: 46s      remaining: 464ms
990:    learn: 0.0028154        total: 46s      remaining: 418ms
991:    learn: 0.0028136        total: 46.1s    remaining: 372ms
992:    learn: 0.0028114        total: 46.1s    remaining: 325ms
993:    learn: 0.0028085        total: 46.2s    remaining: 279ms
994:    learn: 0.0028032        total: 46.2s    remaining: 232ms
995:    learn: 0.0027990        total: 46.2s    remaining: 186ms
996:    learn: 0.0027968        total: 46.3s    remaining: 139ms
997:    learn: 0.0027937        total: 46.3s    remaining: 92.9ms
998:    learn: 0.0027882        total: 46.4s    remaining: 46.4ms
999:    learn: 0.0027861        total: 46.4s    remaining: 0us
```

In [20]:

```
# How long will this take?
start_time = time.time()

# Set params for cross-validation as same as initial model
cv_params = catboost_model.get_params()

# Run the cross-validation for 10-folds (same as the other models)
cv_data = cv(train_pool,
             cv_params,
             fold_count=10,
             plot=True)

# How long did it take?
catboost_time = (time.time() - start_time)

# CatBoost CV results save into a dataframe (cv_data), let's withdraw the maximum accuracy score
acc_cv_catboost = round(np.max(cv_data['test-Accuracy-mean']) * 100, 2)
```

```
 Warning: The least populated class in y has only 5 members, which is too few. The minimum number of members in any class cannot b
e less than parts count=10
0:      learn: 1.0620865        test: 1.0621014 best: 1.0621014 (0)
1:      learn: 1.0224790        test: 1.0203363 best: 1.0203363 (1)
2:      learn: 0.9864710        test: 0.9842903 best: 0.9842903 (2)
3:      learn: 0.9533235        test: 0.9498798 best: 0.9498798 (3)
```

```
4:      learn: 0.9179119        test: 0.9138143 best: 0.9138143 (4)
5:      learn: 0.8869024        test: 0.8825499 best: 0.8825499 (5)
6:      learn: 0.8587515        test: 0.8540891 best: 0.8540891 (6)
7:      learn: 0.8321349        test: 0.8275971 best: 0.8275971 (7)
8:      learn: 0.8051148        test: 0.8008501 best: 0.8008501 (8)
9:      learn: 0.7794809        test: 0.7738954 best: 0.7738954 (9)
10:     learn: 0.7565520        test: 0.7505303 best: 0.7505303 (10)
11:     learn: 0.7331751        test: 0.7254670 best: 0.7254670 (11)
12:     learn: 0.7097949        test: 0.7011321 best: 0.7011321 (12)
13:     learn: 0.6887010        test: 0.6793531 best: 0.6793531 (13)
14:     learn: 0.6684248        test: 0.6589726 best: 0.6589726 (14)
15:     learn: 0.6491084        test: 0.6400204 best: 0.6400204 (15)
16:     learn: 0.6304839        test: 0.6202020 best: 0.6202020 (16)
17:     learn: 0.6130079        test: 0.6027811 best: 0.6027811 (17)
18:     learn: 0.5962797        test: 0.5861106 best: 0.5861106 (18)
19:     learn: 0.5806320        test: 0.5702481 best: 0.5702481 (19)
20:     learn: 0.5653831        test: 0.5554862 best: 0.5554862 (20)
21:     learn: 0.5509255        test: 0.5406213 best: 0.5406213 (21)
22:     learn: 0.5356923        test: 0.5254594 best: 0.5254594 (22)
23:     learn: 0.5218551        test: 0.5118893 best: 0.5118893 (23)
24:     learn: 0.5080095        test: 0.4977685 best: 0.4977685 (24)
25:     learn: 0.4956974        test: 0.4855617 best: 0.4855617 (25)
26:     learn: 0.4825559        test: 0.4724492 best: 0.4724492 (26)
27:     learn: 0.4702087        test: 0.4603665 best: 0.4603665 (27)
28:     learn: 0.4582995        test: 0.4479596 best: 0.4479596 (28)
29:     learn: 0.4467480        test: 0.4367784 best: 0.4367784 (29)
30:     learn: 0.4350797        test: 0.4253968 best: 0.4253968 (30)
31:     learn: 0.4252168        test: 0.4154013 best: 0.4154013 (31)
32:     learn: 0.4158324        test: 0.4060538 best: 0.4060538 (32)
33:     learn: 0.4059314        test: 0.3958221 best: 0.3958221 (33)
34:     learn: 0.3963744        test: 0.3859968 best: 0.3859968 (34)
35:     learn: 0.3875858        test: 0.3771355 best: 0.3771355 (35)
36:     learn: 0.3786126        test: 0.3680077 best: 0.3680077 (36)
37:     learn: 0.3700398        test: 0.3594829 best: 0.3594829 (37)
38:     learn: 0.3616102        test: 0.3511512 best: 0.3511512 (38)
39:     learn: 0.3539567        test: 0.3435045 best: 0.3435045 (39)
40:     learn: 0.3455489        test: 0.3350330 best: 0.3350330 (40)
41:     learn: 0.3381327        test: 0.3282915 best: 0.3282915 (41)
42:     learn: 0.3308430        test: 0.3211790 best: 0.3211790 (42)
43:     learn: 0.3235227        test: 0.3135338 best: 0.3135338 (43)
44:     learn: 0.3166080        test: 0.3064569 best: 0.3064569 (44)
45:     learn: 0.3097749        test: 0.2995280 best: 0.2995280 (45)
46:     learn: 0.3034955        test: 0.2932422 best: 0.2932422 (46)
47:     learn: 0.2973468        test: 0.2871695 best: 0.2871695 (47)
48:     learn: 0.2911285        test: 0.2807854 best: 0.2807854 (48)
49:     learn: 0.2846663        test: 0.2741598 best: 0.2741598 (49)
50:     learn: 0.2788424        test: 0.2683768 best: 0.2683768 (50)
```

```
51:     learn: 0.2731775        test: 0.2628226 best: 0.2628226 (51)
52:     learn: 0.2677082        test: 0.2572674 best: 0.2572674 (52)
53:     learn: 0.2618801        test: 0.2514361 best: 0.2514361 (53)
54:     learn: 0.2565979        test: 0.2463247 best: 0.2463247 (54)
55:     learn: 0.2515198        test: 0.2412212 best: 0.2412212 (55)    total: 17.3s    remaining: 4m 51s
56:     learn: 0.2464138        test: 0.2362495 best: 0.2362495 (56)
57:     learn: 0.2415684        test: 0.2313887 best: 0.2313887 (57)
58:     learn: 0.2367415        test: 0.2267765 best: 0.2267765 (58)
59:     learn: 0.2320562        test: 0.2219017 best: 0.2219017 (59)
60:     learn: 0.2273912        test: 0.2170657 best: 0.2170657 (60)
61:     learn: 0.2233442        test: 0.2132018 best: 0.2132018 (61)
62:     learn: 0.2190478        test: 0.2088184 best: 0.2088184 (62)
63:     learn: 0.2150173        test: 0.2047689 best: 0.2047689 (63)
64:     learn: 0.2108246        test: 0.2005005 best: 0.2005005 (64)
65:     learn: 0.2067250        test: 0.1965066 best: 0.1965066 (65)
66:     learn: 0.2027985        test: 0.1927870 best: 0.1927870 (66)
67:     learn: 0.1991196        test: 0.1892083 best: 0.1892083 (67)
68:     learn: 0.1956665        test: 0.1856365 best: 0.1856365 (68)
69:     learn: 0.1923968        test: 0.1822928 best: 0.1822928 (69)    total: 22.2s    remaining: 4m 55s
70:     learn: 0.1890024        test: 0.1791054 best: 0.1791054 (70)
71:     learn: 0.1857683        test: 0.1760408 best: 0.1760408 (71)
72:     learn: 0.1824646        test: 0.1726043 best: 0.1726043 (72)
73:     learn: 0.1791637        test: 0.1692512 best: 0.1692512 (73)
74:     learn: 0.1761613        test: 0.1661896 best: 0.1661896 (74)
75:     learn: 0.1730871        test: 0.1631105 best: 0.1631105 (75)
76:     learn: 0.1701567        test: 0.1603280 best: 0.1603280 (76)
77:     learn: 0.1672538        test: 0.1573736 best: 0.1573736 (77)
78:     learn: 0.1646339        test: 0.1547217 best: 0.1547217 (78)    total: 26.2s    remaining: 5m 5s
79:     learn: 0.1621289        test: 0.1523111 best: 0.1523111 (79)
80:     learn: 0.1596454        test: 0.1498732 best: 0.1498732 (80)
81:     learn: 0.1568707        test: 0.1472769 best: 0.1472769 (81)
82:     learn: 0.1542810        test: 0.1447550 best: 0.1447550 (82)
83:     learn: 0.1518746        test: 0.1424077 best: 0.1424077 (83)
84:     learn: 0.1495264        test: 0.1399704 best: 0.1399704 (84)
85:     learn: 0.1471902        test: 0.1376782 best: 0.1376782 (85)
86:     learn: 0.1450005        test: 0.1353121 best: 0.1353121 (86)
87:     learn: 0.1429164        test: 0.1331306 best: 0.1331306 (87)
88:     learn: 0.1407675        test: 0.1309362 best: 0.1309362 (88)
89:     learn: 0.1384564        test: 0.1286437 best: 0.1286437 (89)
90:     learn: 0.1364916        test: 0.1268261 best: 0.1268261 (90)
91:     learn: 0.1346286        test: 0.1249294 best: 0.1249294 (91)
92:     learn: 0.1324859        test: 0.1228492 best: 0.1228492 (92)
93:     learn: 0.1306401        test: 0.1211358 best: 0.1211358 (93)
94:     learn: 0.1287411        test: 0.1193073 best: 0.1193073 (94)
95:     learn: 0.1268981        test: 0.1175541 best: 0.1175541 (95)
96:     learn: 0.1251572        test: 0.1157807 best: 0.1157807 (96)
97:     learn: 0.1233255        test: 0.1141480 best: 0.1141480 (97)
```

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98:     learn: 0.1216363        test: 0.1124953 best: 0.1124953 (98)
99:     learn: 0.1198914        test: 0.1108600 best: 0.1108600 (99)
100:    learn: 0.1182338        test: 0.1091260 best: 0.1091260 (100)
101:    learn: 0.1167132        test: 0.1075139 best: 0.1075139 (101)
102:    learn: 0.1151600        test: 0.1060755 best: 0.1060755 (102)
103:    learn: 0.1135268        test: 0.1045559 best: 0.1045559 (103)   total: 36s      remaining: 5m 10s
104:    learn: 0.1119374        test: 0.1030469 best: 0.1030469 (104)
105:    learn: 0.1103134        test: 0.1014476 best: 0.1014476 (105)
106:    learn: 0.1088317        test: 0.1001105 best: 0.1001105 (106)
107:    learn: 0.1072208        test: 0.0987098 best: 0.0987098 (107)
108:    learn: 0.1057723        test: 0.0971710 best: 0.0971710 (108)
109:    learn: 0.1044059        test: 0.0957410 best: 0.0957410 (109)
110:    learn: 0.1030941        test: 0.0944006 best: 0.0944006 (110)
111:    learn: 0.1019571        test: 0.0933278 best: 0.0933278 (111)
112:    learn: 0.1006722        test: 0.0920042 best: 0.0920042 (112)
113:    learn: 0.0993380        test: 0.0907207 best: 0.0907207 (113)
114:    learn: 0.0980843        test: 0.0894732 best: 0.0894732 (114)
115:    learn: 0.0968197        test: 0.0883292 best: 0.0883292 (115)
116:    learn: 0.0954943        test: 0.0869524 best: 0.0869524 (116)
117:    learn: 0.0944517        test: 0.0858748 best: 0.0858748 (117)
118:    learn: 0.0932651        test: 0.0847046 best: 0.0847046 (118)
119:    learn: 0.0922279        test: 0.0836424 best: 0.0836424 (119)
120:    learn: 0.0911422        test: 0.0826154 best: 0.0826154 (120)
121:    learn: 0.0901933        test: 0.0816888 best: 0.0816888 (121)
122:    learn: 0.0891338        test: 0.0806532 best: 0.0806532 (122)
123:    learn: 0.0880509        test: 0.0796551 best: 0.0796551 (123)
124:    learn: 0.0870764        test: 0.0787708 best: 0.0787708 (124)
125:    learn: 0.0860879        test: 0.0778427 best: 0.0778427 (125)
126:    learn: 0.0851435        test: 0.0768419 best: 0.0768419 (126)
127:    learn: 0.0841710        test: 0.0758429 best: 0.0758429 (127)
128:    learn: 0.0831498        test: 0.0748276 best: 0.0748276 (128)
129:    learn: 0.0822311        test: 0.0739689 best: 0.0739689 (129)
130:    learn: 0.0812392        test: 0.0729643 best: 0.0729643 (130)
131:    learn: 0.0804236        test: 0.0721536 best: 0.0721536 (131)
132:    learn: 0.0794942        test: 0.0712298 best: 0.0712298 (132)
133:    learn: 0.0787037        test: 0.0705034 best: 0.0705034 (133)
134:    learn: 0.0778105        test: 0.0696362 best: 0.0696362 (134)
135:    learn: 0.0770149        test: 0.0688632 best: 0.0688632 (135)
136:    learn: 0.0761542        test: 0.0680415 best: 0.0680415 (136)
137:    learn: 0.0752614        test: 0.0671441 best: 0.0671441 (137)   total: 49.1s    remaining: 5m 6s
138:    learn: 0.0745516        test: 0.0664434 best: 0.0664434 (138)
139:    learn: 0.0737533        test: 0.0656678 best: 0.0656678 (139)
140:    learn: 0.0730580        test: 0.0651053 best: 0.0651053 (140)
141:    learn: 0.0722954        test: 0.0643173 best: 0.0643173 (141)
142:    learn: 0.0714677        test: 0.0636548 best: 0.0636548 (142)
143:    learn: 0.0707735        test: 0.0629556 best: 0.0629556 (143)
144:    learn: 0.0700576        test: 0.0623067 best: 0.0623067 (144)
```

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145:    learn: 0.0693563        test: 0.0616360 best: 0.0616360 (145)
146:    learn: 0.0686344        test: 0.0609016 best: 0.0609016 (146)
147:    learn: 0.0679814        test: 0.0602695 best: 0.0602695 (147)
148:    learn: 0.0672369        test: 0.0595745 best: 0.0595745 (148)
149:    learn: 0.0666138        test: 0.0590051 best: 0.0590051 (149)
150:    learn: 0.0659628        test: 0.0584300 best: 0.0584300 (150)   total: 54.4s    remaining: 5m 5s
151:    learn: 0.0652913        test: 0.0577722 best: 0.0577722 (151)
152:    learn: 0.0646162        test: 0.0571585 best: 0.0571585 (152)
153:    learn: 0.0639053        test: 0.0564854 best: 0.0564854 (153)
154:    learn: 0.0633246        test: 0.0559551 best: 0.0559551 (154)
155:    learn: 0.0626932        test: 0.0553724 best: 0.0553724 (155)
156:    learn: 0.0621283        test: 0.0548093 best: 0.0548093 (156)
157:    learn: 0.0615500        test: 0.0542182 best: 0.0542182 (157)
158:    learn: 0.0609635        test: 0.0536275 best: 0.0536275 (158)
159:    learn: 0.0602699        test: 0.0530317 best: 0.0530317 (159)
160:    learn: 0.0597253        test: 0.0525272 best: 0.0525272 (160)
161:    learn: 0.0591532        test: 0.0519749 best: 0.0519749 (161)   total: 59.3s    remaining: 5m 6s
162:    learn: 0.0585669        test: 0.0514430 best: 0.0514430 (162)
163:    learn: 0.0580194        test: 0.0509810 best: 0.0509810 (163)
164:    learn: 0.0575336        test: 0.0504946 best: 0.0504946 (164)
165:    learn: 0.0569426        test: 0.0499225 best: 0.0499225 (165)
166:    learn: 0.0563881        test: 0.0495019 best: 0.0495019 (166)
167:    learn: 0.0558937        test: 0.0490652 best: 0.0490652 (167)
168:    learn: 0.0553887        test: 0.0485578 best: 0.0485578 (168)
169:    learn: 0.0548912        test: 0.0481002 best: 0.0481002 (169)
170:    learn: 0.0543985        test: 0.0476270 best: 0.0476270 (170)
171:    learn: 0.0539320        test: 0.0471709 best: 0.0471709 (171)
172:    learn: 0.0534182        test: 0.0466615 best: 0.0466615 (172)
173:    learn: 0.0530207        test: 0.0462473 best: 0.0462473 (173)
174:    learn: 0.0525373        test: 0.0458362 best: 0.0458362 (174)
175:    learn: 0.0520419        test: 0.0453660 best: 0.0453660 (175)
176:    learn: 0.0516118        test: 0.0449369 best: 0.0449369 (176)   total: 1m 5s    remaining: 5m 2s
177:    learn: 0.0511890        test: 0.0445376 best: 0.0445376 (177)
178:    learn: 0.0507531        test: 0.0441272 best: 0.0441272 (178)
179:    learn: 0.0503467        test: 0.0437457 best: 0.0437457 (179)
180:    learn: 0.0499212        test: 0.0433833 best: 0.0433833 (180)
181:    learn: 0.0495181        test: 0.0430127 best: 0.0430127 (181)
182:    learn: 0.0490884        test: 0.0426561 best: 0.0426561 (182)
183:    learn: 0.0486997        test: 0.0422824 best: 0.0422824 (183)
184:    learn: 0.0483378        test: 0.0419115 best: 0.0419115 (184)
185:    learn: 0.0478992        test: 0.0415249 best: 0.0415249 (185)
186:    learn: 0.0475415        test: 0.0411997 best: 0.0411997 (186)
187:    learn: 0.0471378        test: 0.0408178 best: 0.0408178 (187)
188:    learn: 0.0467782        test: 0.0405308 best: 0.0405308 (188)
189:    learn: 0.0464058        test: 0.0402118 best: 0.0402118 (189)
190:    learn: 0.0460410        test: 0.0399173 best: 0.0399173 (190)
191:    learn: 0.0456741        test: 0.0395709 best: 0.0395709 (191)
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192:    learn: 0.0453105        test: 0.0392309 best: 0.0392309 (192)   total: 1m 11s   remaining: 4m 59s
193:    learn: 0.0449781        test: 0.0389395 best: 0.0389395 (193)
194:    learn: 0.0446459        test: 0.0386915 best: 0.0386915 (194)
195:    learn: 0.0442464        test: 0.0383431 best: 0.0383431 (195)
196:    learn: 0.0439277        test: 0.0380500 best: 0.0380500 (196)
197:    learn: 0.0436476        test: 0.0377911 best: 0.0377911 (197)
198:    learn: 0.0433512        test: 0.0375583 best: 0.0375583 (198)
199:    learn: 0.0429991        test: 0.0372421 best: 0.0372421 (199)
200:    learn: 0.0426832        test: 0.0369777 best: 0.0369777 (200)
201:    learn: 0.0423999        test: 0.0366986 best: 0.0366986 (201)
202:    learn: 0.0420493        test: 0.0363931 best: 0.0363931 (202)
203:    learn: 0.0417236        test: 0.0360845 best: 0.0360845 (203)   total: 1m 16s   remaining: 4m 59s
204:    learn: 0.0414405        test: 0.0358236 best: 0.0358236 (204)
205:    learn: 0.0411594        test: 0.0355644 best: 0.0355644 (205)
206:    learn: 0.0408649        test: 0.0352991 best: 0.0352991 (206)
207:    learn: 0.0405415        test: 0.0350134 best: 0.0350134 (207)
208:    learn: 0.0402292        test: 0.0347356 best: 0.0347356 (208)   total: 1m 18s   remaining: 4m 58s
209:    learn: 0.0399594        test: 0.0344812 best: 0.0344812 (209)
210:    learn: 0.0396921        test: 0.0342872 best: 0.0342872 (210)
211:    learn: 0.0394084        test: 0.0340723 best: 0.0340723 (211)
212:    learn: 0.0391147        test: 0.0337963 best: 0.0337963 (212)
213:    learn: 0.0388171        test: 0.0335409 best: 0.0335409 (213)
214:    learn: 0.0385552        test: 0.0332956 best: 0.0332956 (214)
215:    learn: 0.0383205        test: 0.0330739 best: 0.0330739 (215)
216:    learn: 0.0381017        test: 0.0329014 best: 0.0329014 (216)
217:    learn: 0.0378252        test: 0.0326367 best: 0.0326367 (217)
218:    learn: 0.0375648        test: 0.0324142 best: 0.0324142 (218)
219:    learn: 0.0373290        test: 0.0322221 best: 0.0322221 (219)   total: 1m 23s   remaining: 4m 57s
220:    learn: 0.0371012        test: 0.0320118 best: 0.0320118 (220)
221:    learn: 0.0368845        test: 0.0318262 best: 0.0318262 (221)
222:    learn: 0.0366495        test: 0.0316202 best: 0.0316202 (222)
223:    learn: 0.0364252        test: 0.0314238 best: 0.0314238 (223)
224:    learn: 0.0362145        test: 0.0312268 best: 0.0312268 (224)
225:    learn: 0.0359239        test: 0.0309714 best: 0.0309714 (225)
226:    learn: 0.0356890        test: 0.0307372 best: 0.0307372 (226)
227:    learn: 0.0354665        test: 0.0305586 best: 0.0305586 (227)
228:    learn: 0.0352701        test: 0.0303704 best: 0.0303704 (228)
229:    learn: 0.0350321        test: 0.0301839 best: 0.0301839 (229)
230:    learn: 0.0348136        test: 0.0299780 best: 0.0299780 (230)
231:    learn: 0.0346005        test: 0.0297927 best: 0.0297927 (231)
232:    learn: 0.0343974        test: 0.0296201 best: 0.0296201 (232)
233:    learn: 0.0342035        test: 0.0294333 best: 0.0294333 (233)
234:    learn: 0.0340052        test: 0.0292881 best: 0.0292881 (234)
235:    learn: 0.0337957        test: 0.0290922 best: 0.0290922 (235)   total: 1m 31s   remaining: 4m 56s
236:    learn: 0.0335876        test: 0.0289221 best: 0.0289221 (236)
237:    learn: 0.0334064        test: 0.0287389 best: 0.0287389 (237)
238:    learn: 0.0332159        test: 0.0285781 best: 0.0285781 (238)
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239:    learn: 0.0330268        test: 0.0284305 best: 0.0284305 (239)
240:    learn: 0.0328365        test: 0.0282895 best: 0.0282895 (240)
241:    learn: 0.0326432        test: 0.0281210 best: 0.0281210 (241)
242:    learn: 0.0324556        test: 0.0279709 best: 0.0279709 (242)
243:    learn: 0.0322444        test: 0.0278196 best: 0.0278196 (243)
244:    learn: 0.0320696        test: 0.0276604 best: 0.0276604 (244)
245:    learn: 0.0319077        test: 0.0275085 best: 0.0275085 (245)
246:    learn: 0.0317339        test: 0.0273532 best: 0.0273532 (246)
247:    learn: 0.0315701        test: 0.0272142 best: 0.0272142 (247)   total: 1m 37s   remaining: 4m 54s
248:    learn: 0.0314023        test: 0.0270658 best: 0.0270658 (248)
249:    learn: 0.0312394        test: 0.0269182 best: 0.0269182 (249)
250:    learn: 0.0310696        test: 0.0267657 best: 0.0267657 (250)
251:    learn: 0.0309030        test: 0.0266257 best: 0.0266257 (251)
252:    learn: 0.0307384        test: 0.0264914 best: 0.0264914 (252)
253:    learn: 0.0305626        test: 0.0263511 best: 0.0263511 (253)
254:    learn: 0.0303895        test: 0.0262155 best: 0.0262155 (254)
255:    learn: 0.0302278        test: 0.0260725 best: 0.0260725 (255)
256:    learn: 0.0300731        test: 0.0259601 best: 0.0259601 (256)
257:    learn: 0.0299140        test: 0.0258034 best: 0.0258034 (257)   total: 1m 41s   remaining: 4m 53s
258:    learn: 0.0297616        test: 0.0256834 best: 0.0256834 (258)
259:    learn: 0.0296169        test: 0.0255494 best: 0.0255494 (259)
260:    learn: 0.0294806        test: 0.0254271 best: 0.0254271 (260)
261:    learn: 0.0293485        test: 0.0253478 best: 0.0253478 (261)
262:    learn: 0.0291935        test: 0.0252156 best: 0.0252156 (262)
263:    learn: 0.0290640        test: 0.0251007 best: 0.0251007 (263)
264:    learn: 0.0289257        test: 0.0249708 best: 0.0249708 (264)
265:    learn: 0.0288085        test: 0.0248489 best: 0.0248489 (265)
266:    learn: 0.0286839        test: 0.0247429 best: 0.0247429 (266)
267:    learn: 0.0285530        test: 0.0246144 best: 0.0246144 (267)   total: 1m 47s   remaining: 4m 52s
268:    learn: 0.0284169        test: 0.0245164 best: 0.0245164 (268)
269:    learn: 0.0282776        test: 0.0243868 best: 0.0243868 (269)
270:    learn: 0.0281555        test: 0.0242814 best: 0.0242814 (270)
271:    learn: 0.0280296        test: 0.0241979 best: 0.0241979 (271)
272:    learn: 0.0278959        test: 0.0240909 best: 0.0240909 (272)
273:    learn: 0.0277880        test: 0.0240020 best: 0.0240020 (273)
274:    learn: 0.0276786        test: 0.0239103 best: 0.0239103 (274)
275:    learn: 0.0275671        test: 0.0238143 best: 0.0238143 (275)
276:    learn: 0.0274510        test: 0.0237069 best: 0.0237069 (276)
277:    learn: 0.0273092        test: 0.0235712 best: 0.0235712 (277)
278:    learn: 0.0271922        test: 0.0234630 best: 0.0234630 (278)
279:    learn: 0.0270631        test: 0.0233682 best: 0.0233682 (279)   total: 1m 52s   remaining: 4m 50s
280:    learn: 0.0269462        test: 0.0232878 best: 0.0232878 (280)
281:    learn: 0.0268470        test: 0.0232106 best: 0.0232106 (281)
282:    learn: 0.0267330        test: 0.0231032 best: 0.0231032 (282)
283:    learn: 0.0266195        test: 0.0230118 best: 0.0230118 (283)
284:    learn: 0.0264984        test: 0.0228927 best: 0.0228927 (284)
285:    learn: 0.0263824        test: 0.0227777 best: 0.0227777 (285)
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286:    learn: 0.0262819        test: 0.0226959 best: 0.0226959 (286)
287:    learn: 0.0261703        test: 0.0226216 best: 0.0226216 (287)
288:    learn: 0.0260584        test: 0.0225314 best: 0.0225314 (288)
289:    learn: 0.0259342        test: 0.0224305 best: 0.0224305 (289)
290:    learn: 0.0258383        test: 0.0223452 best: 0.0223452 (290)
291:    learn: 0.0257248        test: 0.0222517 best: 0.0222517 (291)
292:    learn: 0.0256083        test: 0.0221471 best: 0.0221471 (292)
293:    learn: 0.0255059        test: 0.0220532 best: 0.0220532 (293)
294:    learn: 0.0254054        test: 0.0219503 best: 0.0219503 (294)   total: 2m       remaining: 4m 47s
295:    learn: 0.0252933        test: 0.0218499 best: 0.0218499 (295)
296:    learn: 0.0251960        test: 0.0217597 best: 0.0217597 (296)
297:    learn: 0.0251035        test: 0.0216927 best: 0.0216927 (297)
298:    learn: 0.0249995        test: 0.0215971 best: 0.0215971 (298)
299:    learn: 0.0249045        test: 0.0215130 best: 0.0215130 (299)
300:    learn: 0.0248047        test: 0.0214340 best: 0.0214340 (300)
301:    learn: 0.0247105        test: 0.0213505 best: 0.0213505 (301)
302:    learn: 0.0246212        test: 0.0212735 best: 0.0212735 (302)
303:    learn: 0.0245171        test: 0.0211943 best: 0.0211943 (303)   total: 2m 4s    remaining: 4m 46s
304:    learn: 0.0244238        test: 0.0211176 best: 0.0211176 (304)
305:    learn: 0.0243135        test: 0.0210065 best: 0.0210065 (305)
306:    learn: 0.0242131        test: 0.0209380 best: 0.0209380 (306)
307:    learn: 0.0241120        test: 0.0208468 best: 0.0208468 (307)
308:    learn: 0.0240269        test: 0.0207782 best: 0.0207782 (308)
309:    learn: 0.0239376        test: 0.0206909 best: 0.0206909 (309)
310:    learn: 0.0238505        test: 0.0206292 best: 0.0206292 (310)
311:    learn: 0.0237499        test: 0.0205604 best: 0.0205604 (311)
312:    learn: 0.0236578        test: 0.0204983 best: 0.0204983 (312)
313:    learn: 0.0235550        test: 0.0204189 best: 0.0204189 (313)
314:    learn: 0.0234598        test: 0.0203476 best: 0.0203476 (314)   total: 2m 10s   remaining: 4m 43s
315:    learn: 0.0233807        test: 0.0202828 best: 0.0202828 (315)
316:    learn: 0.0232979        test: 0.0202059 best: 0.0202059 (316)
317:    learn: 0.0232182        test: 0.0201449 best: 0.0201449 (317)
318:    learn: 0.0231391        test: 0.0200950 best: 0.0200950 (318)
319:    learn: 0.0230553        test: 0.0200350 best: 0.0200350 (319)
320:    learn: 0.0229709        test: 0.0199694 best: 0.0199694 (320)
321:    learn: 0.0228977        test: 0.0199056 best: 0.0199056 (321)
322:    learn: 0.0228094        test: 0.0198356 best: 0.0198356 (322)
323:    learn: 0.0227342        test: 0.0197833 best: 0.0197833 (323)
324:    learn: 0.0226548        test: 0.0197270 best: 0.0197270 (324)   total: 2m 15s   remaining: 4m 41s
325:    learn: 0.0225707        test: 0.0196507 best: 0.0196507 (325)
326:    learn: 0.0224910        test: 0.0195912 best: 0.0195912 (326)
327:    learn: 0.0224056        test: 0.0195121 best: 0.0195121 (327)
328:    learn: 0.0223373        test: 0.0194564 best: 0.0194564 (328)
329:    learn: 0.0222573        test: 0.0194009 best: 0.0194009 (329)
330:    learn: 0.0221930        test: 0.0193473 best: 0.0193473 (330)
331:    learn: 0.0221235        test: 0.0192979 best: 0.0192979 (331)
332:    learn: 0.0220419        test: 0.0192414 best: 0.0192414 (332)
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333:    learn: 0.0219676        test: 0.0191931 best: 0.0191931 (333)
334:    learn: 0.0218929        test: 0.0191277 best: 0.0191277 (334)
335:    learn: 0.0218156        test: 0.0190613 best: 0.0190613 (335)
336:    learn: 0.0217336        test: 0.0190122 best: 0.0190122 (336)
337:    learn: 0.0216613        test: 0.0189492 best: 0.0189492 (337)
338:    learn: 0.0215976        test: 0.0188910 best: 0.0188910 (338)
339:    learn: 0.0215259        test: 0.0188451 best: 0.0188451 (339)
340:    learn: 0.0214414        test: 0.0187897 best: 0.0187897 (340)
341:    learn: 0.0213809        test: 0.0187446 best: 0.0187446 (341)
342:    learn: 0.0213041        test: 0.0186861 best: 0.0186861 (342)
343:    learn: 0.0212254        test: 0.0186265 best: 0.0186265 (343)   total: 2m 25s   remaining: 4m 37s
344:    learn: 0.0211604        test: 0.0185743 best: 0.0185743 (344)
345:    learn: 0.0210943        test: 0.0185156 best: 0.0185156 (345)
346:    learn: 0.0210296        test: 0.0184648 best: 0.0184648 (346)
347:    learn: 0.0209644        test: 0.0184119 best: 0.0184119 (347)
348:    learn: 0.0208964        test: 0.0183496 best: 0.0183496 (348)
349:    learn: 0.0208316        test: 0.0182975 best: 0.0182975 (349)
350:    learn: 0.0207681        test: 0.0182429 best: 0.0182429 (350)
351:    learn: 0.0207055        test: 0.0181929 best: 0.0181929 (351)
352:    learn: 0.0206340        test: 0.0181443 best: 0.0181443 (352)   total: 2m 29s   remaining: 4m 34s
353:    learn: 0.0205705        test: 0.0180899 best: 0.0180899 (353)
354:    learn: 0.0205020        test: 0.0180138 best: 0.0180138 (354)
355:    learn: 0.0204353        test: 0.0179707 best: 0.0179707 (355)
356:    learn: 0.0203774        test: 0.0179208 best: 0.0179208 (356)
357:    learn: 0.0203164        test: 0.0178700 best: 0.0178700 (357)
358:    learn: 0.0202535        test: 0.0178121 best: 0.0178121 (358)
359:    learn: 0.0201907        test: 0.0177634 best: 0.0177634 (359)
360:    learn: 0.0201341        test: 0.0177309 best: 0.0177309 (360)
361:    learn: 0.0200646        test: 0.0176711 best: 0.0176711 (361)
362:    learn: 0.0200058        test: 0.0176219 best: 0.0176219 (362)
363:    learn: 0.0199446        test: 0.0175680 best: 0.0175680 (363)
364:    learn: 0.0198791        test: 0.0175059 best: 0.0175059 (364)
365:    learn: 0.0198173        test: 0.0174408 best: 0.0174408 (365)
366:    learn: 0.0197524        test: 0.0173932 best: 0.0173932 (366)
367:    learn: 0.0196916        test: 0.0173551 best: 0.0173551 (367)
368:    learn: 0.0196276        test: 0.0173095 best: 0.0173095 (368)
369:    learn: 0.0195662        test: 0.0172625 best: 0.0172625 (369)
370:    learn: 0.0195133        test: 0.0172283 best: 0.0172283 (370)
371:    learn: 0.0194590        test: 0.0171813 best: 0.0171813 (371)
372:    learn: 0.0194041        test: 0.0171349 best: 0.0171349 (372)   total: 2m 39s   remaining: 4m 28s
373:    learn: 0.0193443        test: 0.0170923 best: 0.0170923 (373)
374:    learn: 0.0192929        test: 0.0170564 best: 0.0170564 (374)
375:    learn: 0.0192351        test: 0.0170294 best: 0.0170294 (375)
376:    learn: 0.0191810        test: 0.0169988 best: 0.0169988 (376)
377:    learn: 0.0191231        test: 0.0169415 best: 0.0169415 (377)
378:    learn: 0.0190618        test: 0.0168854 best: 0.0168854 (378)
379:    learn: 0.0190085        test: 0.0168347 best: 0.0168347 (379)
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380:    learn: 0.0189483        test: 0.0167802 best: 0.0167802 (380)
381:    learn: 0.0188968        test: 0.0167335 best: 0.0167335 (381)
382:    learn: 0.0188429        test: 0.0166938 best: 0.0166938 (382)
383:    learn: 0.0187877        test: 0.0166367 best: 0.0166367 (383)
384:    learn: 0.0187294        test: 0.0165980 best: 0.0165980 (384)   total: 2m 45s   remaining: 4m 25s
385:    learn: 0.0186778        test: 0.0165595 best: 0.0165595 (385)
386:    learn: 0.0186220        test: 0.0165047 best: 0.0165047 (386)
387:    learn: 0.0185697        test: 0.0164687 best: 0.0164687 (387)
388:    learn: 0.0185181        test: 0.0164247 best: 0.0164247 (388)
389:    learn: 0.0184587        test: 0.0163779 best: 0.0163779 (389)
390:    learn: 0.0184107        test: 0.0163342 best: 0.0163342 (390)
391:    learn: 0.0183582        test: 0.0162849 best: 0.0162849 (391)
392:    learn: 0.0183026        test: 0.0162399 best: 0.0162399 (392)
393:    learn: 0.0182513        test: 0.0161957 best: 0.0161957 (393)
394:    learn: 0.0182031        test: 0.0161628 best: 0.0161628 (394)
395:    learn: 0.0181534        test: 0.0161138 best: 0.0161138 (395)
396:    learn: 0.0181027        test: 0.0160758 best: 0.0160758 (396)   total: 2m 51s   remaining: 4m 21s
397:    learn: 0.0180533        test: 0.0160424 best: 0.0160424 (397)
398:    learn: 0.0180024        test: 0.0160068 best: 0.0160068 (398)
399:    learn: 0.0179568        test: 0.0159727 best: 0.0159727 (399)
400:    learn: 0.0179120        test: 0.0159303 best: 0.0159303 (400)
401:    learn: 0.0178608        test: 0.0158926 best: 0.0158926 (401)
402:    learn: 0.0178156        test: 0.0158597 best: 0.0158597 (402)
403:    learn: 0.0177668        test: 0.0158193 best: 0.0158193 (403)   total: 2m 55s   remaining: 4m 19s
404:    learn: 0.0177218        test: 0.0157833 best: 0.0157833 (404)
405:    learn: 0.0176722        test: 0.0157506 best: 0.0157506 (405)
406:    learn: 0.0176272        test: 0.0157153 best: 0.0157153 (406)
407:    learn: 0.0175796        test: 0.0156780 best: 0.0156780 (407)
408:    learn: 0.0175331        test: 0.0156411 best: 0.0156411 (408)
409:    learn: 0.0174903        test: 0.0156094 best: 0.0156094 (409)
410:    learn: 0.0174424        test: 0.0155696 best: 0.0155696 (410)
411:    learn: 0.0173926        test: 0.0155337 best: 0.0155337 (411)
412:    learn: 0.0173448        test: 0.0154853 best: 0.0154853 (412)
413:    learn: 0.0172989        test: 0.0154507 best: 0.0154507 (413)
414:    learn: 0.0172508        test: 0.0154161 best: 0.0154161 (414)   total: 3m       remaining: 4m 15s
415:    learn: 0.0172070        test: 0.0153898 best: 0.0153898 (415)
416:    learn: 0.0171546        test: 0.0153522 best: 0.0153522 (416)
417:    learn: 0.0171146        test: 0.0153078 best: 0.0153078 (417)
418:    learn: 0.0170713        test: 0.0152742 best: 0.0152742 (418)
419:    learn: 0.0170283        test: 0.0152471 best: 0.0152471 (419)
420:    learn: 0.0169854        test: 0.0152127 best: 0.0152127 (420)
421:    learn: 0.0169391        test: 0.0151758 best: 0.0151758 (421)
422:    learn: 0.0168938        test: 0.0151425 best: 0.0151425 (422)
423:    learn: 0.0168478        test: 0.0151065 best: 0.0151065 (423)
424:    learn: 0.0168055        test: 0.0150738 best: 0.0150738 (424)   total: 3m 6s    remaining: 4m 11s
425:    learn: 0.0167618        test: 0.0150341 best: 0.0150341 (425)
426:    learn: 0.0167185        test: 0.0150023 best: 0.0150023 (426)
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427:    learn: 0.0166759        test: 0.0149651 best: 0.0149651 (427)
428:    learn: 0.0166369        test: 0.0149301 best: 0.0149301 (428)
429:    learn: 0.0165964        test: 0.0148950 best: 0.0148950 (429)
430:    learn: 0.0165554        test: 0.0148557 best: 0.0148557 (430)
431:    learn: 0.0165150        test: 0.0148193 best: 0.0148193 (431)
432:    learn: 0.0164738        test: 0.0147888 best: 0.0147888 (432)
433:    learn: 0.0164322        test: 0.0147494 best: 0.0147494 (433)
434:    learn: 0.0163889        test: 0.0147087 best: 0.0147087 (434)
435:    learn: 0.0163472        test: 0.0146738 best: 0.0146738 (435)
436:    learn: 0.0163086        test: 0.0146520 best: 0.0146520 (436)
437:    learn: 0.0162750        test: 0.0146213 best: 0.0146213 (437)
438:    learn: 0.0162326        test: 0.0145864 best: 0.0145864 (438)   total: 3m 13s   remaining: 4m 6s
439:    learn: 0.0161896        test: 0.0145549 best: 0.0145549 (439)
440:    learn: 0.0161501        test: 0.0145141 best: 0.0145141 (440)
441:    learn: 0.0161107        test: 0.0144832 best: 0.0144832 (441)
442:    learn: 0.0160756        test: 0.0144578 best: 0.0144578 (442)
443:    learn: 0.0160347        test: 0.0144228 best: 0.0144228 (443)
444:    learn: 0.0159890        test: 0.0143853 best: 0.0143853 (444)
445:    learn: 0.0159475        test: 0.0143495 best: 0.0143495 (445)
446:    learn: 0.0159079        test: 0.0143083 best: 0.0143083 (446)
447:    learn: 0.0158669        test: 0.0142836 best: 0.0142836 (447)
448:    learn: 0.0158281        test: 0.0142515 best: 0.0142515 (448)
449:    learn: 0.0157886        test: 0.0142306 best: 0.0142306 (449)   total: 3m 18s   remaining: 4m 2s
450:    learn: 0.0157478        test: 0.0142031 best: 0.0142031 (450)
451:    learn: 0.0157086        test: 0.0141659 best: 0.0141659 (451)
452:    learn: 0.0156716        test: 0.0141470 best: 0.0141470 (452)
453:    learn: 0.0156338        test: 0.0141190 best: 0.0141190 (453)
454:    learn: 0.0155964        test: 0.0140904 best: 0.0140904 (454)
455:    learn: 0.0155644        test: 0.0140629 best: 0.0140629 (455)
456:    learn: 0.0155269        test: 0.0140271 best: 0.0140271 (456)
457:    learn: 0.0154931        test: 0.0140005 best: 0.0140005 (457)
458:    learn: 0.0154535        test: 0.0139586 best: 0.0139586 (458)
459:    learn: 0.0154170        test: 0.0139329 best: 0.0139329 (459)
460:    learn: 0.0153822        test: 0.0139056 best: 0.0139056 (460)
461:    learn: 0.0153456        test: 0.0138805 best: 0.0138805 (461)
462:    learn: 0.0153080        test: 0.0138542 best: 0.0138542 (462)   total: 3m 25s   remaining: 3m 58s
463:    learn: 0.0152711        test: 0.0138309 best: 0.0138309 (463)
464:    learn: 0.0152332        test: 0.0138027 best: 0.0138027 (464)
465:    learn: 0.0151944        test: 0.0137728 best: 0.0137728 (465)
466:    learn: 0.0151591        test: 0.0137365 best: 0.0137365 (466)
467:    learn: 0.0151225        test: 0.0137109 best: 0.0137109 (467)
468:    learn: 0.0150845        test: 0.0136750 best: 0.0136750 (468)
469:    learn: 0.0150513        test: 0.0136399 best: 0.0136399 (469)
470:    learn: 0.0150128        test: 0.0136084 best: 0.0136084 (470)
471:    learn: 0.0149776        test: 0.0135840 best: 0.0135840 (471)
472:    learn: 0.0149420        test: 0.0135522 best: 0.0135522 (472)
473:    learn: 0.0149080        test: 0.0135194 best: 0.0135194 (473)
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474:    learn: 0.0148811        test: 0.0135011 best: 0.0135011 (474)
475:    learn: 0.0148497        test: 0.0134703 best: 0.0134703 (475)
476:    learn: 0.0148179        test: 0.0134410 best: 0.0134410 (476)
477:    learn: 0.0147867        test: 0.0134194 best: 0.0134194 (477)
478:    learn: 0.0147566        test: 0.0133957 best: 0.0133957 (478)   total: 3m 33s   remaining: 3m 52s
479:    learn: 0.0147241        test: 0.0133669 best: 0.0133669 (479)
480:    learn: 0.0146896        test: 0.0133309 best: 0.0133309 (480)
481:    learn: 0.0146557        test: 0.0133027 best: 0.0133027 (481)
482:    learn: 0.0146256        test: 0.0132748 best: 0.0132748 (482)
483:    learn: 0.0145924        test: 0.0132400 best: 0.0132400 (483)
484:    learn: 0.0145576        test: 0.0132103 best: 0.0132103 (484)
485:    learn: 0.0145229        test: 0.0131894 best: 0.0131894 (485)
486:    learn: 0.0144950        test: 0.0131663 best: 0.0131663 (486)
487:    learn: 0.0144620        test: 0.0131405 best: 0.0131405 (487)
488:    learn: 0.0144308        test: 0.0131201 best: 0.0131201 (488)
489:    learn: 0.0143992        test: 0.0130917 best: 0.0130917 (489)
490:    learn: 0.0143654        test: 0.0130584 best: 0.0130584 (490)   total: 3m 39s   remaining: 3m 47s
491:    learn: 0.0143336        test: 0.0130354 best: 0.0130354 (491)
492:    learn: 0.0143033        test: 0.0130022 best: 0.0130022 (492)
493:    learn: 0.0142726        test: 0.0129830 best: 0.0129830 (493)
494:    learn: 0.0142379        test: 0.0129538 best: 0.0129538 (494)
495:    learn: 0.0142047        test: 0.0129235 best: 0.0129235 (495)
496:    learn: 0.0141741        test: 0.0129032 best: 0.0129032 (496)
497:    learn: 0.0141463        test: 0.0128825 best: 0.0128825 (497)
498:    learn: 0.0141169        test: 0.0128656 best: 0.0128656 (498)
499:    learn: 0.0140870        test: 0.0128453 best: 0.0128453 (499)
500:    learn: 0.0140552        test: 0.0128230 best: 0.0128230 (500)
501:    learn: 0.0140253        test: 0.0128038 best: 0.0128038 (501)
502:    learn: 0.0139928        test: 0.0127718 best: 0.0127718 (502)
503:    learn: 0.0139607        test: 0.0127475 best: 0.0127475 (503)   total: 3m 46s   remaining: 3m 42s
504:    learn: 0.0139296        test: 0.0127153 best: 0.0127153 (504)
505:    learn: 0.0138991        test: 0.0126920 best: 0.0126920 (505)
506:    learn: 0.0138733        test: 0.0126716 best: 0.0126716 (506)
507:    learn: 0.0138460        test: 0.0126486 best: 0.0126486 (507)
508:    learn: 0.0138200        test: 0.0126285 best: 0.0126285 (508)
509:    learn: 0.0137932        test: 0.0126048 best: 0.0126048 (509)
510:    learn: 0.0137610        test: 0.0125833 best: 0.0125833 (510)
511:    learn: 0.0137318        test: 0.0125537 best: 0.0125537 (511)
512:    learn: 0.0137015        test: 0.0125278 best: 0.0125278 (512)
513:    learn: 0.0136727        test: 0.0125053 best: 0.0125053 (513)
514:    learn: 0.0136462        test: 0.0124833 best: 0.0124833 (514)   total: 3m 51s   remaining: 3m 38s
515:    learn: 0.0136178        test: 0.0124550 best: 0.0124550 (515)
516:    learn: 0.0135902        test: 0.0124339 best: 0.0124339 (516)
517:    learn: 0.0135612        test: 0.0124125 best: 0.0124125 (517)
518:    learn: 0.0135305        test: 0.0123880 best: 0.0123880 (518)
519:    learn: 0.0135021        test: 0.0123637 best: 0.0123637 (519)
520:    learn: 0.0134724        test: 0.0123382 best: 0.0123382 (520)
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521:    learn: 0.0134467        test: 0.0123221 best: 0.0123221 (521)
522:    learn: 0.0134176        test: 0.0122963 best: 0.0122963 (522)
523:    learn: 0.0133902        test: 0.0122801 best: 0.0122801 (523)
524:    learn: 0.0133638        test: 0.0122597 best: 0.0122597 (524)
525:    learn: 0.0133329        test: 0.0122385 best: 0.0122385 (525)
526:    learn: 0.0133078        test: 0.0122133 best: 0.0122133 (526)   total: 3m 58s   remaining: 3m 33s
527:    learn: 0.0132753        test: 0.0121929 best: 0.0121929 (527)
528:    learn: 0.0132451        test: 0.0121677 best: 0.0121677 (528)
529:    learn: 0.0132163        test: 0.0121491 best: 0.0121491 (529)   total: 3m 59s   remaining: 3m 32s
530:    learn: 0.0131884        test: 0.0121273 best: 0.0121273 (530)
531:    learn: 0.0131630        test: 0.0121062 best: 0.0121062 (531)
532:    learn: 0.0131369        test: 0.0120845 best: 0.0120845 (532)
533:    learn: 0.0131093        test: 0.0120629 best: 0.0120629 (533)
534:    learn: 0.0130798        test: 0.0120445 best: 0.0120445 (534)
535:    learn: 0.0130543        test: 0.0120283 best: 0.0120283 (535)
536:    learn: 0.0130309        test: 0.0120096 best: 0.0120096 (536)
537:    learn: 0.0130073        test: 0.0119849 best: 0.0119849 (537)
538:    learn: 0.0129816        test: 0.0119616 best: 0.0119616 (538)   total: 4m 4s    remaining: 3m 28s
539:    learn: 0.0129522        test: 0.0119395 best: 0.0119395 (539)
540:    learn: 0.0129260        test: 0.0119140 best: 0.0119140 (540)
541:    learn: 0.0128984        test: 0.0118894 best: 0.0118894 (541)
542:    learn: 0.0128731        test: 0.0118694 best: 0.0118694 (542)
543:    learn: 0.0128442        test: 0.0118458 best: 0.0118458 (543)
544:    learn: 0.0128190        test: 0.0118274 best: 0.0118274 (544)
545:    learn: 0.0127918        test: 0.0118026 best: 0.0118026 (545)
546:    learn: 0.0127657        test: 0.0117859 best: 0.0117859 (546)
547:    learn: 0.0127401        test: 0.0117644 best: 0.0117644 (547)   total: 4m 8s    remaining: 3m 25s
548:    learn: 0.0127136        test: 0.0117473 best: 0.0117473 (548)
549:    learn: 0.0126876        test: 0.0117233 best: 0.0117233 (549)
550:    learn: 0.0126616        test: 0.0117095 best: 0.0117095 (550)
551:    learn: 0.0126346        test: 0.0116836 best: 0.0116836 (551)
552:    learn: 0.0126079        test: 0.0116584 best: 0.0116584 (552)
553:    learn: 0.0125849        test: 0.0116421 best: 0.0116421 (553)
554:    learn: 0.0125607        test: 0.0116248 best: 0.0116248 (554)
555:    learn: 0.0125358        test: 0.0116009 best: 0.0116009 (555)
556:    learn: 0.0125133        test: 0.0115784 best: 0.0115784 (556)
557:    learn: 0.0124867        test: 0.0115582 best: 0.0115582 (557)
558:    learn: 0.0124645        test: 0.0115391 best: 0.0115391 (558)
559:    learn: 0.0124422        test: 0.0115201 best: 0.0115201 (559)
560:    learn: 0.0124146        test: 0.0114993 best: 0.0114993 (560)   total: 4m 15s   remaining: 3m 20s
561:    learn: 0.0123905        test: 0.0114846 best: 0.0114846 (561)
562:    learn: 0.0123674        test: 0.0114626 best: 0.0114626 (562)
563:    learn: 0.0123443        test: 0.0114405 best: 0.0114405 (563)
564:    learn: 0.0123254        test: 0.0114244 best: 0.0114244 (564)
565:    learn: 0.0122997        test: 0.0114024 best: 0.0114024 (565)
566:    learn: 0.0122761        test: 0.0113849 best: 0.0113849 (566)
567:    learn: 0.0122541        test: 0.0113658 best: 0.0113658 (567)
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568:    learn: 0.0122286        test: 0.0113476 best: 0.0113476 (568)
569:    learn: 0.0122024        test: 0.0113276 best: 0.0113276 (569)
570:    learn: 0.0121768        test: 0.0113077 best: 0.0113077 (570)
571:    learn: 0.0121526        test: 0.0112877 best: 0.0112877 (571)
572:    learn: 0.0121299        test: 0.0112752 best: 0.0112752 (572)   total: 4m 22s   remaining: 3m 15s
573:    learn: 0.0121051        test: 0.0112544 best: 0.0112544 (573)
574:    learn: 0.0120795        test: 0.0112382 best: 0.0112382 (574)
575:    learn: 0.0120554        test: 0.0112169 best: 0.0112169 (575)
576:    learn: 0.0120303        test: 0.0111985 best: 0.0111985 (576)
577:    learn: 0.0120088        test: 0.0111854 best: 0.0111854 (577)
578:    learn: 0.0119865        test: 0.0111644 best: 0.0111644 (578)
579:    learn: 0.0119662        test: 0.0111515 best: 0.0111515 (579)
580:    learn: 0.0119424        test: 0.0111372 best: 0.0111372 (580)
581:    learn: 0.0119175        test: 0.0111173 best: 0.0111173 (581)
582:    learn: 0.0118964        test: 0.0110994 best: 0.0110994 (582)
583:    learn: 0.0118750        test: 0.0110814 best: 0.0110814 (583)
584:    learn: 0.0118552        test: 0.0110696 best: 0.0110696 (584)   total: 4m 29s   remaining: 3m 11s
585:    learn: 0.0118312        test: 0.0110484 best: 0.0110484 (585)
586:    learn: 0.0118094        test: 0.0110288 best: 0.0110288 (586)
587:    learn: 0.0117886        test: 0.0110148 best: 0.0110148 (587)
588:    learn: 0.0117683        test: 0.0109952 best: 0.0109952 (588)
589:    learn: 0.0117466        test: 0.0109785 best: 0.0109785 (589)
590:    learn: 0.0117246        test: 0.0109618 best: 0.0109618 (590)
591:    learn: 0.0117010        test: 0.0109353 best: 0.0109353 (591)
592:    learn: 0.0116806        test: 0.0109189 best: 0.0109189 (592)
593:    learn: 0.0116594        test: 0.0109042 best: 0.0109042 (593)
594:    learn: 0.0116376        test: 0.0108908 best: 0.0108908 (594)
595:    learn: 0.0116180        test: 0.0108745 best: 0.0108745 (595)
596:    learn: 0.0115979        test: 0.0108569 best: 0.0108569 (596)
597:    learn: 0.0115776        test: 0.0108436 best: 0.0108436 (597)
598:    learn: 0.0115555        test: 0.0108267 best: 0.0108267 (598)
599:    learn: 0.0115329        test: 0.0108129 best: 0.0108129 (599)
600:    learn: 0.0115124        test: 0.0107930 best: 0.0107930 (600)
601:    learn: 0.0114912        test: 0.0107785 best: 0.0107785 (601)
602:    learn: 0.0114707        test: 0.0107567 best: 0.0107567 (602)
603:    learn: 0.0114519        test: 0.0107438 best: 0.0107438 (603)
604:    learn: 0.0114312        test: 0.0107270 best: 0.0107270 (604)
605:    learn: 0.0114143        test: 0.0107136 best: 0.0107136 (605)
606:    learn: 0.0113930        test: 0.0106958 best: 0.0106958 (606)
607:    learn: 0.0113742        test: 0.0106799 best: 0.0106799 (607)   total: 4m 41s   remaining: 3m 1s
608:    learn: 0.0113550        test: 0.0106677 best: 0.0106677 (608)
609:    learn: 0.0113363        test: 0.0106560 best: 0.0106560 (609)
610:    learn: 0.0113170        test: 0.0106428 best: 0.0106428 (610)
611:    learn: 0.0112973        test: 0.0106300 best: 0.0106300 (611)
612:    learn: 0.0112776        test: 0.0106112 best: 0.0106112 (612)
613:    learn: 0.0112588        test: 0.0105919 best: 0.0105919 (613)
614:    learn: 0.0112426        test: 0.0105803 best: 0.0105803 (614)
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615:    learn: 0.0112236        test: 0.0105648 best: 0.0105648 (615)
616:    learn: 0.0112017        test: 0.0105501 best: 0.0105501 (616)
617:    learn: 0.0111802        test: 0.0105339 best: 0.0105339 (617)
618:    learn: 0.0111613        test: 0.0105216 best: 0.0105216 (618)   total: 4m 47s   remaining: 2m 56s
619:    learn: 0.0111422        test: 0.0105050 best: 0.0105050 (619)
620:    learn: 0.0111213        test: 0.0104805 best: 0.0104805 (620)
621:    learn: 0.0111002        test: 0.0104640 best: 0.0104640 (621)
622:    learn: 0.0110810        test: 0.0104476 best: 0.0104476 (622)
623:    learn: 0.0110593        test: 0.0104261 best: 0.0104261 (623)
624:    learn: 0.0110395        test: 0.0104106 best: 0.0104106 (624)
625:    learn: 0.0110209        test: 0.0103927 best: 0.0103927 (625)
626:    learn: 0.0110026        test: 0.0103756 best: 0.0103756 (626)   total: 4m 51s   remaining: 2m 53s
627:    learn: 0.0109845        test: 0.0103601 best: 0.0103601 (627)
628:    learn: 0.0109656        test: 0.0103466 best: 0.0103466 (628)
629:    learn: 0.0109451        test: 0.0103252 best: 0.0103252 (629)
630:    learn: 0.0109267        test: 0.0103140 best: 0.0103140 (630)
631:    learn: 0.0109081        test: 0.0103010 best: 0.0103010 (631)
632:    learn: 0.0108906        test: 0.0102898 best: 0.0102898 (632)
633:    learn: 0.0108712        test: 0.0102739 best: 0.0102739 (633)
634:    learn: 0.0108534        test: 0.0102589 best: 0.0102589 (634)
635:    learn: 0.0108365        test: 0.0102465 best: 0.0102465 (635)
636:    learn: 0.0108193        test: 0.0102341 best: 0.0102341 (636)
637:    learn: 0.0108027        test: 0.0102221 best: 0.0102221 (637)
638:    learn: 0.0107834        test: 0.0102055 best: 0.0102055 (638)
639:    learn: 0.0107664        test: 0.0101924 best: 0.0101924 (639)
640:    learn: 0.0107473        test: 0.0101749 best: 0.0101749 (640)   total: 4m 59s   remaining: 2m 47s
641:    learn: 0.0107298        test: 0.0101613 best: 0.0101613 (641)
642:    learn: 0.0107118        test: 0.0101439 best: 0.0101439 (642)
643:    learn: 0.0106945        test: 0.0101283 best: 0.0101283 (643)
644:    learn: 0.0106766        test: 0.0101080 best: 0.0101080 (644)
645:    learn: 0.0106591        test: 0.0100863 best: 0.0100863 (645)
646:    learn: 0.0106404        test: 0.0100744 best: 0.0100744 (646)
647:    learn: 0.0106227        test: 0.0100580 best: 0.0100580 (647)
648:    learn: 0.0106061        test: 0.0100423 best: 0.0100423 (648)
649:    learn: 0.0105885        test: 0.0100311 best: 0.0100311 (649)
650:    learn: 0.0105714        test: 0.0100140 best: 0.0100140 (650)   total: 5m 4s    remaining: 2m 43s
651:    learn: 0.0105545        test: 0.0100007 best: 0.0100007 (651)
652:    learn: 0.0105357        test: 0.0099868 best: 0.0099868 (652)
653:    learn: 0.0105166        test: 0.0099728 best: 0.0099728 (653)
654:    learn: 0.0105017        test: 0.0099605 best: 0.0099605 (654)
655:    learn: 0.0104863        test: 0.0099512 best: 0.0099512 (655)
656:    learn: 0.0104693        test: 0.0099353 best: 0.0099353 (656)
657:    learn: 0.0104536        test: 0.0099225 best: 0.0099225 (657)
658:    learn: 0.0104364        test: 0.0099086 best: 0.0099086 (658)
659:    learn: 0.0104204        test: 0.0098950 best: 0.0098950 (659)   total: 5m 9s    remaining: 2m 39s
660:    learn: 0.0104044        test: 0.0098808 best: 0.0098808 (660)
661:    learn: 0.0103880        test: 0.0098622 best: 0.0098622 (661)
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662:    learn: 0.0103721        test: 0.0098514 best: 0.0098514 (662)
663:    learn: 0.0103556        test: 0.0098336 best: 0.0098336 (663)
664:    learn: 0.0103393        test: 0.0098219 best: 0.0098219 (664)
665:    learn: 0.0103216        test: 0.0098093 best: 0.0098093 (665)
666:    learn: 0.0103044        test: 0.0097995 best: 0.0097995 (666)
667:    learn: 0.0102877        test: 0.0097913 best: 0.0097913 (667)
668:    learn: 0.0102733        test: 0.0097812 best: 0.0097812 (668)
669:    learn: 0.0102585        test: 0.0097729 best: 0.0097729 (669)
670:    learn: 0.0102401        test: 0.0097623 best: 0.0097623 (670)   total: 5m 15s   remaining: 2m 34s
671:    learn: 0.0102234        test: 0.0097510 best: 0.0097510 (671)
672:    learn: 0.0102061        test: 0.0097373 best: 0.0097373 (672)
673:    learn: 0.0101917        test: 0.0097279 best: 0.0097279 (673)
674:    learn: 0.0101748        test: 0.0097100 best: 0.0097100 (674)
675:    learn: 0.0101585        test: 0.0096973 best: 0.0096973 (675)
676:    learn: 0.0101428        test: 0.0096847 best: 0.0096847 (676)
677:    learn: 0.0101263        test: 0.0096741 best: 0.0096741 (677)
678:    learn: 0.0101102        test: 0.0096614 best: 0.0096614 (678)
679:    learn: 0.0100952        test: 0.0096471 best: 0.0096471 (679)
680:    learn: 0.0100794        test: 0.0096349 best: 0.0096349 (680)   total: 5m 20s   remaining: 2m 30s
681:    learn: 0.0100641        test: 0.0096222 best: 0.0096222 (681)
682:    learn: 0.0100497        test: 0.0096088 best: 0.0096088 (682)
683:    learn: 0.0100333        test: 0.0095945 best: 0.0095945 (683)
684:    learn: 0.0100176        test: 0.0095838 best: 0.0095838 (684)
685:    learn: 0.0100017        test: 0.0095667 best: 0.0095667 (685)
686:    learn: 0.0099870        test: 0.0095525 best: 0.0095525 (686)
687:    learn: 0.0099724        test: 0.0095384 best: 0.0095384 (687)
688:    learn: 0.0099585        test: 0.0095282 best: 0.0095282 (688)
689:    learn: 0.0099428        test: 0.0095147 best: 0.0095147 (689)
690:    learn: 0.0099273        test: 0.0095037 best: 0.0095037 (690)   total: 5m 25s   remaining: 2m 25s
691:    learn: 0.0099114        test: 0.0094938 best: 0.0094938 (691)
692:    learn: 0.0098969        test: 0.0094828 best: 0.0094828 (692)
693:    learn: 0.0098800        test: 0.0094691 best: 0.0094691 (693)
694:    learn: 0.0098624        test: 0.0094538 best: 0.0094538 (694)
695:    learn: 0.0098458        test: 0.0094381 best: 0.0094381 (695)
696:    learn: 0.0098317        test: 0.0094268 best: 0.0094268 (696)
697:    learn: 0.0098158        test: 0.0094128 best: 0.0094128 (697)
698:    learn: 0.0098013        test: 0.0094001 best: 0.0094001 (698)   total: 5m 30s   remaining: 2m 22s
699:    learn: 0.0097883        test: 0.0093899 best: 0.0093899 (699)
700:    learn: 0.0097749        test: 0.0093788 best: 0.0093788 (700)
701:    learn: 0.0097599        test: 0.0093678 best: 0.0093678 (701)
702:    learn: 0.0097427        test: 0.0093560 best: 0.0093560 (702)
703:    learn: 0.0097294        test: 0.0093472 best: 0.0093472 (703)
704:    learn: 0.0097139        test: 0.0093333 best: 0.0093333 (704)
705:    learn: 0.0096994        test: 0.0093243 best: 0.0093243 (705)   total: 5m 34s   remaining: 2m 19s
706:    learn: 0.0096847        test: 0.0093105 best: 0.0093105 (706)
707:    learn: 0.0096703        test: 0.0092959 best: 0.0092959 (707)
708:    learn: 0.0096557        test: 0.0092830 best: 0.0092830 (708)
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709:    learn: 0.0096418        test: 0.0092714 best: 0.0092714 (709)
710:    learn: 0.0096282        test: 0.0092571 best: 0.0092571 (710)
711:    learn: 0.0096123        test: 0.0092433 best: 0.0092433 (711)
712:    learn: 0.0095969        test: 0.0092346 best: 0.0092346 (712)
713:    learn: 0.0095816        test: 0.0092218 best: 0.0092218 (713)
714:    learn: 0.0095672        test: 0.0092043 best: 0.0092043 (714)
715:    learn: 0.0095538        test: 0.0091944 best: 0.0091944 (715)
716:    learn: 0.0095389        test: 0.0091814 best: 0.0091814 (716)
717:    learn: 0.0095238        test: 0.0091700 best: 0.0091700 (717)
718:    learn: 0.0095105        test: 0.0091590 best: 0.0091590 (718)
719:    learn: 0.0094973        test: 0.0091482 best: 0.0091482 (719)
720:    learn: 0.0094839        test: 0.0091375 best: 0.0091375 (720)
721:    learn: 0.0094713        test: 0.0091307 best: 0.0091307 (721)   total: 5m 41s   remaining: 2m 11s
722:    learn: 0.0094567        test: 0.0091190 best: 0.0091190 (722)
723:    learn: 0.0094429        test: 0.0091068 best: 0.0091068 (723)
724:    learn: 0.0094288        test: 0.0090934 best: 0.0090934 (724)
725:    learn: 0.0094150        test: 0.0090834 best: 0.0090834 (725)
726:    learn: 0.0094022        test: 0.0090733 best: 0.0090733 (726)
727:    learn: 0.0093893        test: 0.0090656 best: 0.0090656 (727)
728:    learn: 0.0093754        test: 0.0090524 best: 0.0090524 (728)
729:    learn: 0.0093614        test: 0.0090392 best: 0.0090392 (729)
730:    learn: 0.0093485        test: 0.0090299 best: 0.0090299 (730)
731:    learn: 0.0093342        test: 0.0090194 best: 0.0090194 (731)
732:    learn: 0.0093197        test: 0.0090069 best: 0.0090069 (732)   total: 5m 47s   remaining: 2m 6s
733:    learn: 0.0093064        test: 0.0089989 best: 0.0089989 (733)
734:    learn: 0.0092925        test: 0.0089867 best: 0.0089867 (734)
735:    learn: 0.0092779        test: 0.0089736 best: 0.0089736 (735)
736:    learn: 0.0092652        test: 0.0089617 best: 0.0089617 (736)
737:    learn: 0.0092513        test: 0.0089526 best: 0.0089526 (737)
738:    learn: 0.0092388        test: 0.0089403 best: 0.0089403 (738)
739:    learn: 0.0092266        test: 0.0089300 best: 0.0089300 (739)
740:    learn: 0.0092149        test: 0.0089223 best: 0.0089223 (740)
741:    learn: 0.0092000        test: 0.0089103 best: 0.0089103 (741)
742:    learn: 0.0091856        test: 0.0088944 best: 0.0088944 (742)
743:    learn: 0.0091734        test: 0.0088845 best: 0.0088845 (743)
744:    learn: 0.0091601        test: 0.0088738 best: 0.0088738 (744)
745:    learn: 0.0091480        test: 0.0088672 best: 0.0088672 (745)
746:    learn: 0.0091350        test: 0.0088624 best: 0.0088624 (746)   total: 5m 54s   remaining: 2m
747:    learn: 0.0091232        test: 0.0088518 best: 0.0088518 (747)
748:    learn: 0.0091093        test: 0.0088394 best: 0.0088394 (748)
749:    learn: 0.0090947        test: 0.0088272 best: 0.0088272 (749)
750:    learn: 0.0090805        test: 0.0088153 best: 0.0088153 (750)
751:    learn: 0.0090666        test: 0.0088033 best: 0.0088033 (751)
752:    learn: 0.0090533        test: 0.0087932 best: 0.0087932 (752)
753:    learn: 0.0090400        test: 0.0087841 best: 0.0087841 (753)
754:    learn: 0.0090265        test: 0.0087741 best: 0.0087741 (754)   total: 5m 59s   remaining: 1m 56s
755:    learn: 0.0090133        test: 0.0087648 best: 0.0087648 (755)
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756:    learn: 0.0090004        test: 0.0087537 best: 0.0087537 (756)
757:    learn: 0.0089890        test: 0.0087420 best: 0.0087420 (757)
758:    learn: 0.0089759        test: 0.0087324 best: 0.0087324 (758)
759:    learn: 0.0089620        test: 0.0087233 best: 0.0087233 (759)
760:    learn: 0.0089495        test: 0.0087156 best: 0.0087156 (760)
761:    learn: 0.0089368        test: 0.0087085 best: 0.0087085 (761)
762:    learn: 0.0089246        test: 0.0086995 best: 0.0086995 (762)
763:    learn: 0.0089112        test: 0.0086865 best: 0.0086865 (763)
764:    learn: 0.0088977        test: 0.0086727 best: 0.0086727 (764)
765:    learn: 0.0088861        test: 0.0086663 best: 0.0086663 (765)   total: 6m 5s    remaining: 1m 51s
766:    learn: 0.0088718        test: 0.0086578 best: 0.0086578 (766)
767:    learn: 0.0088595        test: 0.0086495 best: 0.0086495 (767)
768:    learn: 0.0088476        test: 0.0086415 best: 0.0086415 (768)
769:    learn: 0.0088353        test: 0.0086337 best: 0.0086337 (769)
770:    learn: 0.0088226        test: 0.0086238 best: 0.0086238 (770)
771:    learn: 0.0088101        test: 0.0086135 best: 0.0086135 (771)
772:    learn: 0.0087966        test: 0.0086057 best: 0.0086057 (772)
773:    learn: 0.0087843        test: 0.0085954 best: 0.0085954 (773)
774:    learn: 0.0087720        test: 0.0085849 best: 0.0085849 (774)
775:    learn: 0.0087580        test: 0.0085678 best: 0.0085678 (775)
776:    learn: 0.0087470        test: 0.0085574 best: 0.0085574 (776)
777:    learn: 0.0087355        test: 0.0085472 best: 0.0085472 (777)   total: 6m 12s   remaining: 1m 46s
778:    learn: 0.0087229        test: 0.0085358 best: 0.0085358 (778)
779:    learn: 0.0087112        test: 0.0085276 best: 0.0085276 (779)
780:    learn: 0.0087003        test: 0.0085151 best: 0.0085151 (780)
781:    learn: 0.0086874        test: 0.0085013 best: 0.0085013 (781)
782:    learn: 0.0086745        test: 0.0084898 best: 0.0084898 (782)
783:    learn: 0.0086631        test: 0.0084774 best: 0.0084774 (783)
784:    learn: 0.0086518        test: 0.0084669 best: 0.0084669 (784)
785:    learn: 0.0086398        test: 0.0084567 best: 0.0084567 (785)
786:    learn: 0.0086278        test: 0.0084465 best: 0.0084465 (786)
787:    learn: 0.0086174        test: 0.0084405 best: 0.0084405 (787)
788:    learn: 0.0086070        test: 0.0084330 best: 0.0084330 (788)   total: 6m 18s   remaining: 1m 41s
789:    learn: 0.0085950        test: 0.0084236 best: 0.0084236 (789)
790:    learn: 0.0085847        test: 0.0084171 best: 0.0084171 (790)
791:    learn: 0.0085737        test: 0.0084058 best: 0.0084058 (791)
792:    learn: 0.0085619        test: 0.0083984 best: 0.0083984 (792)
793:    learn: 0.0085511        test: 0.0083909 best: 0.0083909 (793)
794:    learn: 0.0085404        test: 0.0083830 best: 0.0083830 (794)
795:    learn: 0.0085284        test: 0.0083743 best: 0.0083743 (795)
796:    learn: 0.0085182        test: 0.0083641 best: 0.0083641 (796)
797:    learn: 0.0085079        test: 0.0083548 best: 0.0083548 (797)
798:    learn: 0.0084965        test: 0.0083423 best: 0.0083423 (798)
799:    learn: 0.0084855        test: 0.0083317 best: 0.0083317 (799)
800:    learn: 0.0084728        test: 0.0083193 best: 0.0083193 (800)
801:    learn: 0.0084619        test: 0.0083138 best: 0.0083138 (801)
802:    learn: 0.0084520        test: 0.0083049 best: 0.0083049 (802)   total: 6m 25s   remaining: 1m 34s
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803:    learn: 0.0084402        test: 0.0082952 best: 0.0082952 (803)
804:    learn: 0.0084292        test: 0.0082846 best: 0.0082846 (804)
805:    learn: 0.0084185        test: 0.0082777 best: 0.0082777 (805)
806:    learn: 0.0084079        test: 0.0082654 best: 0.0082654 (806)
807:    learn: 0.0083969        test: 0.0082556 best: 0.0082556 (807)
808:    learn: 0.0083868        test: 0.0082475 best: 0.0082475 (808)
809:    learn: 0.0083758        test: 0.0082387 best: 0.0082387 (809)
810:    learn: 0.0083649        test: 0.0082295 best: 0.0082295 (810)
811:    learn: 0.0083537        test: 0.0082216 best: 0.0082216 (811)
812:    learn: 0.0083432        test: 0.0082129 best: 0.0082129 (812)   total: 6m 30s   remaining: 1m 29s
813:    learn: 0.0083332        test: 0.0082046 best: 0.0082046 (813)
814:    learn: 0.0083237        test: 0.0081970 best: 0.0081970 (814)
815:    learn: 0.0083125        test: 0.0081858 best: 0.0081858 (815)
816:    learn: 0.0083002        test: 0.0081780 best: 0.0081780 (816)
817:    learn: 0.0082886        test: 0.0081658 best: 0.0081658 (817)
818:    learn: 0.0082779        test: 0.0081542 best: 0.0081542 (818)
819:    learn: 0.0082680        test: 0.0081448 best: 0.0081448 (819)
820:    learn: 0.0082571        test: 0.0081377 best: 0.0081377 (820)   total: 6m 35s   remaining: 1m 26s
821:    learn: 0.0082464        test: 0.0081291 best: 0.0081291 (821)
822:    learn: 0.0082358        test: 0.0081203 best: 0.0081203 (822)
823:    learn: 0.0082258        test: 0.0081092 best: 0.0081092 (823)
824:    learn: 0.0082164        test: 0.0080991 best: 0.0080991 (824)
825:    learn: 0.0082068        test: 0.0080904 best: 0.0080904 (825)
826:    learn: 0.0081956        test: 0.0080836 best: 0.0080836 (826)
827:    learn: 0.0081853        test: 0.0080739 best: 0.0080739 (827)
828:    learn: 0.0081764        test: 0.0080679 best: 0.0080679 (828)
829:    learn: 0.0081672        test: 0.0080629 best: 0.0080629 (829)
830:    learn: 0.0081562        test: 0.0080499 best: 0.0080499 (830)
831:    learn: 0.0081457        test: 0.0080415 best: 0.0080415 (831)
832:    learn: 0.0081342        test: 0.0080317 best: 0.0080317 (832)
833:    learn: 0.0081240        test: 0.0080233 best: 0.0080233 (833)   total: 6m 41s   remaining: 1m 19s
834:    learn: 0.0081138        test: 0.0080138 best: 0.0080138 (834)
835:    learn: 0.0081051        test: 0.0080081 best: 0.0080081 (835)
836:    learn: 0.0080923        test: 0.0079987 best: 0.0079987 (836)
837:    learn: 0.0080817        test: 0.0079909 best: 0.0079909 (837)
838:    learn: 0.0080702        test: 0.0079826 best: 0.0079826 (838)
839:    learn: 0.0080605        test: 0.0079700 best: 0.0079700 (839)
840:    learn: 0.0080522        test: 0.0079645 best: 0.0079645 (840)
841:    learn: 0.0080431        test: 0.0079553 best: 0.0079553 (841)
842:    learn: 0.0080341        test: 0.0079483 best: 0.0079483 (842)
843:    learn: 0.0080251        test: 0.0079417 best: 0.0079417 (843)
844:    learn: 0.0080144        test: 0.0079326 best: 0.0079326 (844)
845:    learn: 0.0080048        test: 0.0079224 best: 0.0079224 (845)
846:    learn: 0.0079956        test: 0.0079133 best: 0.0079133 (846)
847:    learn: 0.0079864        test: 0.0079050 best: 0.0079050 (847)   total: 6m 48s   remaining: 1m 13s
848:    learn: 0.0079763        test: 0.0078952 best: 0.0078952 (848)
849:    learn: 0.0079658        test: 0.0078882 best: 0.0078882 (849)
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850:    learn: 0.0079546        test: 0.0078788 best: 0.0078788 (850)
851:    learn: 0.0079451        test: 0.0078708 best: 0.0078708 (851)
852:    learn: 0.0079335        test: 0.0078597 best: 0.0078597 (852)
853:    learn: 0.0079242        test: 0.0078506 best: 0.0078506 (853)
854:    learn: 0.0079140        test: 0.0078412 best: 0.0078412 (854)
855:    learn: 0.0079039        test: 0.0078318 best: 0.0078318 (855)   total: 6m 53s   remaining: 1m 9s
856:    learn: 0.0078948        test: 0.0078260 best: 0.0078260 (856)
857:    learn: 0.0078848        test: 0.0078141 best: 0.0078141 (857)
858:    learn: 0.0078752        test: 0.0078072 best: 0.0078072 (858)
859:    learn: 0.0078660        test: 0.0078003 best: 0.0078003 (859)
860:    learn: 0.0078577        test: 0.0077913 best: 0.0077913 (860)
861:    learn: 0.0078481        test: 0.0077825 best: 0.0077825 (861)
862:    learn: 0.0078389        test: 0.0077717 best: 0.0077717 (862)
863:    learn: 0.0078293        test: 0.0077641 best: 0.0077641 (863)
864:    learn: 0.0078181        test: 0.0077582 best: 0.0077582 (864)
865:    learn: 0.0078087        test: 0.0077486 best: 0.0077486 (865)   total: 6m 58s   remaining: 1m 4s
866:    learn: 0.0077987        test: 0.0077421 best: 0.0077421 (866)
867:    learn: 0.0077899        test: 0.0077364 best: 0.0077364 (867)
868:    learn: 0.0077811        test: 0.0077296 best: 0.0077296 (868)
869:    learn: 0.0077713        test: 0.0077233 best: 0.0077233 (869)
870:    learn: 0.0077621        test: 0.0077124 best: 0.0077124 (870)
871:    learn: 0.0077527        test: 0.0077039 best: 0.0077039 (871)
872:    learn: 0.0077431        test: 0.0076974 best: 0.0076974 (872)
873:    learn: 0.0077342        test: 0.0076893 best: 0.0076893 (873)   total: 7m 3s    remaining: 1m
874:    learn: 0.0077241        test: 0.0076816 best: 0.0076816 (874)
875:    learn: 0.0077150        test: 0.0076739 best: 0.0076739 (875)
876:    learn: 0.0077054        test: 0.0076658 best: 0.0076658 (876)
877:    learn: 0.0076960        test: 0.0076579 best: 0.0076579 (877)
878:    learn: 0.0076854        test: 0.0076471 best: 0.0076471 (878)
879:    learn: 0.0076761        test: 0.0076398 best: 0.0076398 (879)
880:    learn: 0.0076679        test: 0.0076352 best: 0.0076352 (880)
881:    learn: 0.0076584        test: 0.0076267 best: 0.0076267 (881)   total: 7m 7s    remaining: 57.2s
882:    learn: 0.0076496        test: 0.0076210 best: 0.0076210 (882)
883:    learn: 0.0076406        test: 0.0076142 best: 0.0076142 (883)
884:    learn: 0.0076323        test: 0.0076071 best: 0.0076071 (884)
885:    learn: 0.0076237        test: 0.0075978 best: 0.0075978 (885)
886:    learn: 0.0076146        test: 0.0075944 best: 0.0075944 (886)
887:    learn: 0.0076051        test: 0.0075865 best: 0.0075865 (887)
888:    learn: 0.0075958        test: 0.0075753 best: 0.0075753 (888)
889:    learn: 0.0075860        test: 0.0075664 best: 0.0075664 (889)
890:    learn: 0.0075760        test: 0.0075593 best: 0.0075593 (890)
891:    learn: 0.0075667        test: 0.0075535 best: 0.0075535 (891)   total: 7m 13s   remaining: 52.4s
892:    learn: 0.0075575        test: 0.0075471 best: 0.0075471 (892)
893:    learn: 0.0075496        test: 0.0075427 best: 0.0075427 (893)
894:    learn: 0.0075403        test: 0.0075357 best: 0.0075357 (894)
895:    learn: 0.0075316        test: 0.0075273 best: 0.0075273 (895)
896:    learn: 0.0075240        test: 0.0075199 best: 0.0075199 (896)
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897:    learn: 0.0075155        test: 0.0075122 best: 0.0075122 (897)
898:    learn: 0.0075045        test: 0.0075025 best: 0.0075025 (898)
899:    learn: 0.0074956        test: 0.0074942 best: 0.0074942 (899)   total: 7m 17s   remaining: 48.6s
900:    learn: 0.0074865        test: 0.0074885 best: 0.0074885 (900)
901:    learn: 0.0074784        test: 0.0074797 best: 0.0074797 (901)
902:    learn: 0.0074693        test: 0.0074708 best: 0.0074708 (902)
903:    learn: 0.0074597        test: 0.0074648 best: 0.0074648 (903)
904:    learn: 0.0074511        test: 0.0074580 best: 0.0074580 (904)
905:    learn: 0.0074432        test: 0.0074485 best: 0.0074485 (905)
906:    learn: 0.0074353        test: 0.0074406 best: 0.0074406 (906)
907:    learn: 0.0074258        test: 0.0074322 best: 0.0074322 (907)
908:    learn: 0.0074172        test: 0.0074262 best: 0.0074262 (908)
909:    learn: 0.0074091        test: 0.0074190 best: 0.0074190 (909)
910:    learn: 0.0074014        test: 0.0074148 best: 0.0074148 (910)
911:    learn: 0.0073932        test: 0.0074063 best: 0.0074063 (911)   total: 7m 23s   remaining: 42.8s
912:    learn: 0.0073849        test: 0.0073994 best: 0.0073994 (912)
913:    learn: 0.0073773        test: 0.0073923 best: 0.0073923 (913)
914:    learn: 0.0073681        test: 0.0073869 best: 0.0073869 (914)
915:    learn: 0.0073598        test: 0.0073789 best: 0.0073789 (915)
916:    learn: 0.0073527        test: 0.0073753 best: 0.0073753 (916)
917:    learn: 0.0073440        test: 0.0073661 best: 0.0073661 (917)
918:    learn: 0.0073355        test: 0.0073569 best: 0.0073569 (918)
919:    learn: 0.0073277        test: 0.0073502 best: 0.0073502 (919)
920:    learn: 0.0073197        test: 0.0073421 best: 0.0073421 (920)
921:    learn: 0.0073114        test: 0.0073356 best: 0.0073356 (921)
922:    learn: 0.0073022        test: 0.0073301 best: 0.0073301 (922)
923:    learn: 0.0072948        test: 0.0073250 best: 0.0073250 (923)
924:    learn: 0.0072863        test: 0.0073200 best: 0.0073200 (924)   total: 7m 30s   remaining: 36.6s
925:    learn: 0.0072786        test: 0.0073115 best: 0.0073115 (925)
926:    learn: 0.0072714        test: 0.0073053 best: 0.0073053 (926)
927:    learn: 0.0072641        test: 0.0072985 best: 0.0072985 (927)
928:    learn: 0.0072568        test: 0.0072911 best: 0.0072911 (928)
929:    learn: 0.0072486        test: 0.0072857 best: 0.0072857 (929)
930:    learn: 0.0072407        test: 0.0072789 best: 0.0072789 (930)
931:    learn: 0.0072327        test: 0.0072735 best: 0.0072735 (931)
932:    learn: 0.0072239        test: 0.0072665 best: 0.0072665 (932)   total: 7m 34s   remaining: 32.7s
933:    learn: 0.0072155        test: 0.0072598 best: 0.0072598 (933)
934:    learn: 0.0072074        test: 0.0072550 best: 0.0072550 (934)
935:    learn: 0.0072001        test: 0.0072471 best: 0.0072471 (935)
936:    learn: 0.0071908        test: 0.0072390 best: 0.0072390 (936)
937:    learn: 0.0071836        test: 0.0072346 best: 0.0072346 (937)
938:    learn: 0.0071761        test: 0.0072303 best: 0.0072303 (938)
939:    learn: 0.0071693        test: 0.0072245 best: 0.0072245 (939)
940:    learn: 0.0071609        test: 0.0072192 best: 0.0072192 (940)
941:    learn: 0.0071537        test: 0.0072148 best: 0.0072148 (941)
942:    learn: 0.0071454        test: 0.0072084 best: 0.0072084 (942)
943:    learn: 0.0071370        test: 0.0072025 best: 0.0072025 (943)
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944:    learn: 0.0071278        test: 0.0071969 best: 0.0071969 (944)
945:    learn: 0.0071202        test: 0.0071901 best: 0.0071901 (945)
946:    learn: 0.0071116        test: 0.0071803 best: 0.0071803 (946)
947:    learn: 0.0071035        test: 0.0071706 best: 0.0071706 (947)   total: 7m 42s   remaining: 25.4s
948:    learn: 0.0070956        test: 0.0071639 best: 0.0071639 (948)
949:    learn: 0.0070883        test: 0.0071563 best: 0.0071563 (949)
950:    learn: 0.0070807        test: 0.0071481 best: 0.0071481 (950)
951:    learn: 0.0070732        test: 0.0071422 best: 0.0071422 (951)
952:    learn: 0.0070646        test: 0.0071339 best: 0.0071339 (952)
953:    learn: 0.0070568        test: 0.0071281 best: 0.0071281 (953)
954:    learn: 0.0070496        test: 0.0071232 best: 0.0071232 (954)
955:    learn: 0.0070408        test: 0.0071145 best: 0.0071145 (955)
956:    learn: 0.0070331        test: 0.0071109 best: 0.0071109 (956)
957:    learn: 0.0070256        test: 0.0071041 best: 0.0071041 (957)
958:    learn: 0.0070178        test: 0.0070957 best: 0.0070957 (958)
959:    learn: 0.0070111        test: 0.0070878 best: 0.0070878 (959)   total: 7m 48s   remaining: 19.5s
960:    learn: 0.0070035        test: 0.0070828 best: 0.0070828 (960)
961:    learn: 0.0069962        test: 0.0070770 best: 0.0070770 (961)
962:    learn: 0.0069888        test: 0.0070721 best: 0.0070721 (962)
963:    learn: 0.0069802        test: 0.0070672 best: 0.0070672 (963)
964:    learn: 0.0069729        test: 0.0070617 best: 0.0070617 (964)
965:    learn: 0.0069668        test: 0.0070564 best: 0.0070564 (965)
966:    learn: 0.0069596        test: 0.0070514 best: 0.0070514 (966)
967:    learn: 0.0069516        test: 0.0070451 best: 0.0070451 (967)
968:    learn: 0.0069441        test: 0.0070404 best: 0.0070404 (968)
969:    learn: 0.0069358        test: 0.0070284 best: 0.0070284 (969)
970:    learn: 0.0069282        test: 0.0070228 best: 0.0070228 (970)
971:    learn: 0.0069211        test: 0.0070167 best: 0.0070167 (971)
972:    learn: 0.0069134        test: 0.0070116 best: 0.0070116 (972)
973:    learn: 0.0069052        test: 0.0070023 best: 0.0070023 (973)
974:    learn: 0.0068976        test: 0.0069964 best: 0.0069964 (974)   total: 7m 56s   remaining: 12.2s
975:    learn: 0.0068902        test: 0.0069903 best: 0.0069903 (975)
976:    learn: 0.0068836        test: 0.0069831 best: 0.0069831 (976)
977:    learn: 0.0068772        test: 0.0069788 best: 0.0069788 (977)
978:    learn: 0.0068702        test: 0.0069743 best: 0.0069743 (978)
979:    learn: 0.0068641        test: 0.0069697 best: 0.0069697 (979)
980:    learn: 0.0068571        test: 0.0069658 best: 0.0069658 (980)
981:    learn: 0.0068494        test: 0.0069582 best: 0.0069582 (981)
982:    learn: 0.0068415        test: 0.0069500 best: 0.0069500 (982)
983:    learn: 0.0068356        test: 0.0069452 best: 0.0069452 (983)   total: 8m 1s    remaining: 7.83s
984:    learn: 0.0068283        test: 0.0069385 best: 0.0069385 (984)
985:    learn: 0.0068215        test: 0.0069337 best: 0.0069337 (985)
986:    learn: 0.0068146        test: 0.0069286 best: 0.0069286 (986)
987:    learn: 0.0068074        test: 0.0069218 best: 0.0069218 (987)
988:    learn: 0.0067991        test: 0.0069143 best: 0.0069143 (988)
989:    learn: 0.0067920        test: 0.0069110 best: 0.0069110 (989)
990:    learn: 0.0067848        test: 0.0069052 best: 0.0069052 (990)
```

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991:    learn: 0.0067787        test: 0.0069010 best: 0.0069010 (991)
992:    learn: 0.0067718        test: 0.0068972 best: 0.0068972 (992)
993:    learn: 0.0067642        test: 0.0068903 best: 0.0068903 (993)
994:    learn: 0.0067572        test: 0.0068871 best: 0.0068871 (994)
995:    learn: 0.0067499        test: 0.0068794 best: 0.0068794 (995)   total: 8m 8s    remaining: 1.96s
996:    learn: 0.0067432        test: 0.0068740 best: 0.0068740 (996)
997:    learn: 0.0067357        test: 0.0068688 best: 0.0068688 (997)
998:    learn: 0.0067287        test: 0.0068625 best: 0.0068625 (998)
999:    learn: 0.0067216        test: 0.0068545 best: 0.0068545 (999)   total: 8m 10s   remaining: 0us
```

In [21]:
```
print("---CatBoost Metrics---")
print("Accuracy: {}".format(acc_catboost))
print("Accuracy cross-validation 10-Fold: {}".format(acc_cv_catboost))
print("Running Time: {}".format(datetime.timedelta(seconds=catboost_time)))
```

```
---CatBoost Metrics---
Accuracy: 100.0
Accuracy cross-validation 10-Fold: 100.0
Running Time: 0:08:11.201148
```

In [22]:
```
models = pd.DataFrame({
    'Model': ['KNN', 'Logistic Regression', 'Naive Bayes',
              'Stochastic Gradient Decent', 'Linear SVC',
              'Decision Tree', 'Gradient Boosting Trees',
              'CatBoost'],
    'Score': [
        acc_knn,
        acc_log,
        acc_gaussian,
        acc_sgd,
        acc_linear_svc,
        acc_dt,
        acc_gbt,
        acc_catboost
    ]})
print("---Reuglar Accuracy Scores---")
models.sort_values(by='Score', ascending=False)
```

```
---Reuglar Accuracy Scores---
```

Out[22]:

	Model	Score
2	Naive Bayes	100.00
5	Decision Tree	100.00
6	Gradient Boosting Trees	100.00

	Model	Score
7	CatBoost	100.00
1	Logistic Regression	99.18
0	KNN	89.34
3	Stochastic Gradient Decent	65.57
4	Linear SVC	22.13

In [23]:
```
cv_models = pd.DataFrame({
    'Model': ['KNN', 'Logistic Regression', 'Naive Bayes',
              'Stochastic Gradient Decent', 'Linear SVC',
              'Decision Tree', 'Gradient Boosting Trees',
              'CatBoost'],
    'Score': [
        acc_cv_knn,
        acc_cv_log,
        acc_cv_gaussian,
        acc_cv_sgd,
        acc_cv_linear_svc,
        acc_cv_dt,
        acc_cv_gbt,
        acc_cv_catboost
    ]})
print('---Cross-validation Accuracy Scores---')
cv_models.sort_values(by='Score', ascending=False)
```

```
---Cross-validation Accuracy Scores---
```

Out[23]:

	Model	Score
5	Decision Tree	100.00
6	Gradient Boosting Trees	100.00
7	CatBoost	100.00
2	Naive Bayes	98.36
1	Logistic Regression	95.90
4	Linear SVC	93.44

	Model	Score
0	KNN	89.34
3	Stochastic Gradient Decent	81.15

In [ ]: