

In [1]:

```
1 import pandas as pd
2 import numpy as np
3 import matplotlib.pyplot as plt
4 import statsmodels.api as sm
5 import seaborn as sns
6 from tqdm import tqdm_notebook
7 import warnings
8 from statsmodels.tsa.stattools import kpss
9 from statsmodels.stats.multitest import multipletests
10 from statsmodels.tsa.holtwinters import ExponentialSmoothing
11 from sklearn.preprocessing import StandardScaler
12
13 from xgboost import XGBClassifier
14 import lightgbm as lgb
15 from sklearn.model_selection import StratifiedKFold, KFold
16 from sklearn.metrics import mean_absolute_error
17 import time
18 from catboost import CatBoostRegressor, CatBoostClassifier
19
20 import lightgbm as lgb
21 import xgboost as xgb
22 import catboost as ctb
23
24 from sklearn.model_selection import train_test_split
25 from sklearn.metrics import f1_score
26
27 import gc
28
29 from scripts.feature_engineering import reduce_mem_usage, add_rolling_features
30 from scripts.feature_engineering import exponential_smoothing, signal_shifts
31 from scripts.feature_engineering import batch_stats2, add_minus_signal
32 from scripts.feature_engineering import delete_objects_after_rolling
33
34 from scripts.feature_engineering import add_quantiles, add_target_encoding
35
36 from copy import copy
37
38 from bayes_opt import BayesianOptimization
39
40 warnings.filterwarnings('ignore')
41 sns.set_style('whitegrid')
```

Обучение catboost.

Попробуем обучить дефолтный катбуст на сгенерированных ранее признаках.

In [2]:

```
1 train = pd.read_csv('data-without-drift/train_clean.csv')
2 test = pd.read_csv('data-without-drift/test_clean.csv')
```

In [3]:

```
1 train.tail()
```

Out[3]:

	time	signal	open_channels
4999995	499.9996	2.919274	7
4999996	499.9997	2.697906	7
4999997	499.9998	4.516337	8
4999998	499.9999	5.639669	9
4999999	500.0000	5.379200	9

In [4]:

```
1 test.tail()
```

Out[4]:

	time	signal
1999995	699.9996	-2.9092
1999996	699.9997	-2.7422
1999997	699.9998	-2.8285
1999998	699.9999	-2.9092
1999999	700.0000	-2.7422

Добавим признаки и применим сжатие данных.

In [5]:

```
▼ 1 def prepare_df(df, window_sizes, alphas, shifts, batch_sizes):
  2     df = reduce_mem_usage(df)
  3     df = add_rolling_features(df, window_sizes)
  4     df = reduce_mem_usage(df)
  5     df = exponential_smoothing(df, alphas)
  6     df = reduce_mem_usage(df)
  7     df = signal_shifts(df, shifts)
  8     df = reduce_mem_usage(df)
  9     df = add_minus_signal(df)
 10     df = reduce_mem_usage(df)
 11     df = batch_stats2(df, batch_sizes)
 12     df = reduce_mem_usage(df)
 13     df = add_minus_signal(df)
 14     df = reduce_mem_usage(df)
 15
 16     if 'open_channels' in df.columns:
 17         y = df['open_channels']
 18         df = df.drop(columns=['time'])
 19         return df, y
 20     else:
 21         df = df.drop(columns=['time'])
 22         return df
```

In [6]:

```
1 window_sizes = [5, 100, 5000]
2 alphas = [0.5, 0.1]
3 shifts = [1, 2, -1, -2]
4 batch_sizes = [50000, 25000, 5000]
5 quantiles = [3, 7, 15]
6
7 X_train, y_train = prepare_df(train, window_sizes, alphas, shifts, batch_sizes)
8 X_test = prepare_df(test, window_sizes, alphas, shifts, batch_sizes)
9
10 add_quantiles(X_train, X_test, [3, 7, 15])
11 add_target_encoding(X_train, X_test, [3, 7, 15])
12
13 X_train = X_train.drop(columns=['open_channels'])
```

Mem. usage decreased to 23.84 Mb (79.2% reduction)

HBox(children=(FloatProgress(value=0.0, max=3.0), HTML(value='')))

Mem. usage decreased to 295.64 Mb (72.9% reduction)

Mem. usage decreased to 314.71 Mb (15.4% reduction)

Mem. usage decreased to 352.86 Mb (0.0% reduction)

Mem. usage decreased to 677.11 Mb (0.0% reduction)

Mem. usage decreased to 991.82 Mb (48.8% reduction)

Mem. usage decreased to 1630.78 Mb (0.0% reduction)

Mem. usage decreased to 7.63 Mb (75.0% reduction)

HBox(children=(FloatProgress(value=0.0, max=3.0), HTML(value='')))

Mem. usage decreased to 120.16 Mb (72.4% reduction)

Mem. usage decreased to 127.79 Mb (15.2% reduction)

Mem. usage decreased to 143.05 Mb (0.0% reduction)

Mem. usage decreased to 276.57 Mb (0.0% reduction)

Mem. usage decreased to 402.45 Mb (48.4% reduction)

Mem. usage decreased to 661.85 Mb (0.0% reduction)

HBox(children=(FloatProgress(value=0.0, max=3.0), HTML(value='')))

Для улучшения качества модели будем передавать наименования колонок категориальных признаков.

In [7]:

```
1 quant_columns = np.array(quantiles).astype(str)
2
3 for i in range(len(quant_columns)):
4     quant_columns[i] = 'quant_' + quant_columns[i]
5
6 quant_columns = quant_columns.tolist()
```

In [8]:

```
1 def MacroF1Metric(preds, dtrain):
2     labels = dtrain.get_label()
3     preds = np.round(np.clip(preds, 0, 10)).astype(int)
4     score = f1_score(labels, preds, average = 'macro')
5     return ('MacroF1Metric', score, True)
```

Применим кросс-валидацию. Будем каждый раз обучать модель на 4 фолдах из 5. В конце усредним предсказания.

Также, сохраним out of fold предсказания для дальнейшего стекинга моделей.

In [10]:

```
1 def catboost_cv_loop(X_train, y_train, X_test, params, num_iterations):
2     n_fold = 5
3     folds = KFold(n_splits=n_fold, shuffle=True, random_state=17)
4
5     oof = np.zeros(len(X_train))
6     prediction = np.zeros(len(X_test))
7     scores = []
8
9     for training_index, validation_index in tqdm_notebook(folds.split(X_train)):
10         # разбиение на трэйн и валидацию
11         X_train_ = X_train.iloc[training_index]
12         y_train_ = y_train[training_index]
13         X_valid = X_train.iloc[validation_index]
14         y_valid = y_train[validation_index]
15
16         model = CatBoostRegressor(
17             random_seed=17,
18             verbose=6,
19             cat_features=quant_columns
20         )
21
22         # обучение модели
23         model.fit(X_train_, y_train_, )
24
25         # скор на валидации
26         preds = model.predict(X_valid)
27         oof[validation_index] = preds.reshape(-1,)
28
29         preds = np.round(np.clip(preds, 0, 10)).astype(int)
30         score = f1_score(y_valid, preds, average = 'macro')
31         scores.append(score)
32
33         # предсказание на тесте
34         preds = model.predict(X_test)
35         prediction += preds
36
37         print(f'score: {score}')
38
39     prediction /= n_fold
40     # prediction = np.round(np.clip(prediction, 0, 10)).astype(int)
41
42     return scores, oof, prediction
```

In [11]:

```
1 scores, oof, prediction = catboost_cv_loop(X_train, y_train, X_test, np.nan, n
HBox(children=(FloatProgress(value=0.0, max=5.0), HTML(value='')))

Learning rate set to 0.170831
0:      learn: 2.2208776      total: 2.51s      remaining: 41m 43s
6:      learn: 0.7656598      total: 13.3s     remaining: 31m 21s
12:     learn: 0.3227851      total: 23.2s     remaining: 29m 22s
18:     learn: 0.2142144      total: 33.4s     remaining: 28m 44s
24:     learn: 0.1915270      total: 42.9s     remaining: 27m 52s
30:     learn: 0.1843314      total: 52.8s     remaining: 27m 30s
36:     learn: 0.1807013      total: 1m 2s     remaining: 27m 2s
42:     learn: 0.1782891      total: 1m 11s    remaining: 26m 27s
48:     learn: 0.1761109      total: 1m 20s    remaining: 25m 56s
54:     learn: 0.1745443      total: 1m 29s    remaining: 25m 38s
60:     learn: 0.1731750      total: 1m 39s    remaining: 25m 26s
66:     learn: 0.1718982      total: 1m 49s    remaining: 25m 20s
72:     learn: 0.1707438      total: 1m 59s    remaining: 25m 21s
78:     learn: 0.1699044      total: 2m 10s    remaining: 25m 19s
84:     learn: 0.1692466      total: 2m 21s    remaining: 25m 23s
90:     learn: 0.1684047      total: 2m 30s    remaining: 25m 8s
96:     learn: 0.1677844      total: 2m 41s    remaining: 25m 7s
102:    learn: 0.1671540      total: 2m 51s    remaining: 24m 52s
108:    learn: 0.1666604      total: 3m 1s     remaining: 24m 40s
114:    learn: 0.1662037      total: 3m 15s    remaining: 25m 5s
120:    learn: 0.1658101      total: 3m 26s    remaining: 25m 2s
126:    learn: 0.1653806      total: 3m 37s    remaining: 24m 52s
132:    learn: 0.1650382      total: 3m 49s    remaining: 24m 54s
138:    learn: 0.1646625      total: 4m        remaining: 24m 47s
144:    learn: 0.1643607      total: 4m 11s    remaining: 24m 43s
150:    learn: 0.1641107      total: 4m 26s    remaining: 25m
156:    learn: 0.1638068      total: 4m 38s    remaining: 24m 54s
162:    learn: 0.1635162      total: 4m 47s    remaining: 24m 35s
168:    learn: 0.1632612      total: 4m 58s    remaining: 24m 28s
174:    learn: 0.1630001      total: 5m 14s    remaining: 24m 42s
180:    learn: 0.1627858      total: 5m 24s    remaining: 24m 28s
186:    learn: 0.1625500      total: 5m 33s    remaining: 24m 10s
192:    learn: 0.1623824      total: 5m 43s    remaining: 23m 54s
198:    learn: 0.1621719      total: 5m 55s    remaining: 23m 50s
204:    learn: 0.1620097      total: 6m 4s     remaining: 23m 32s
210:    learn: 0.1617830      total: 6m 13s    remaining: 23m 16s
216:    learn: 0.1615955      total: 6m 25s    remaining: 23m 11s
222:    learn: 0.1613735      total: 6m 36s    remaining: 22m 59s
228:    learn: 0.1612114      total: 6m 45s    remaining: 22m 46s
234:    learn: 0.1610131      total: 6m 55s    remaining: 22m 30s
240:    learn: 0.1608707      total: 7m 4s     remaining: 22m 15s
246:    learn: 0.1606895      total: 7m 14s    remaining: 22m 3s
252:    learn: 0.1605551      total: 7m 23s    remaining: 21m 50s
258:    learn: 0.1604173      total: 7m 36s    remaining: 21m 46s
264:    learn: 0.1602759      total: 7m 47s    remaining: 21m 37s
270:    learn: 0.1601435      total: 7m 57s    remaining: 21m 24s
276:    learn: 0.1600373      total: 8m 6s     remaining: 21m 10s
282:    learn: 0.1599177      total: 8m 19s    remaining: 21m 6s
288:    learn: 0.1598011      total: 8m 31s    remaining: 20m 59s
294:    learn: 0.1596867      total: 8m 44s    remaining: 20m 54s
300:    learn: 0.1595989      total: 8m 55s    remaining: 20m 44s
306:    learn: 0.1594879      total: 9m 5s     remaining: 20m 31s
312:    learn: 0.1593811      total: 9m 14s    remaining: 20m 17s
318:    learn: 0.1592635      total: 9m 24s    remaining: 20m 5s
```

324:	learn: 0.1591746	total: 9m 34s	remaining: 19m 53s
330:	learn: 0.1590864	total: 9m 43s	remaining: 19m 39s
336:	learn: 0.1590011	total: 9m 52s	remaining: 19m 26s
342:	learn: 0.1589181	total: 10m 2s	remaining: 19m 14s
348:	learn: 0.1588131	total: 10m 13s	remaining: 19m 3s
354:	learn: 0.1587245	total: 10m 23s	remaining: 18m 52s
360:	learn: 0.1586325	total: 10m 33s	remaining: 18m 40s
366:	learn: 0.1585575	total: 10m 42s	remaining: 18m 27s
372:	learn: 0.1584720	total: 10m 51s	remaining: 18m 15s
378:	learn: 0.1583997	total: 11m	remaining: 18m 2s
384:	learn: 0.1583373	total: 11m 9s	remaining: 17m 49s
390:	learn: 0.1582694	total: 11m 18s	remaining: 17m 36s
396:	learn: 0.1581909	total: 11m 33s	remaining: 17m 33s
402:	learn: 0.1581115	total: 11m 48s	remaining: 17m 29s
408:	learn: 0.1580517	total: 12m	remaining: 17m 21s
414:	learn: 0.1579872	total: 12m 11s	remaining: 17m 10s
420:	learn: 0.1579241	total: 12m 21s	remaining: 16m 59s
426:	learn: 0.1578597	total: 12m 31s	remaining: 16m 49s
432:	learn: 0.1577908	total: 12m 42s	remaining: 16m 38s
438:	learn: 0.1577378	total: 12m 57s	remaining: 16m 33s
444:	learn: 0.1576578	total: 13m 9s	remaining: 16m 25s
450:	learn: 0.1576021	total: 13m 22s	remaining: 16m 16s
456:	learn: 0.1575327	total: 13m 33s	remaining: 16m 6s
462:	learn: 0.1574774	total: 13m 45s	remaining: 15m 57s
468:	learn: 0.1574287	total: 13m 55s	remaining: 15m 46s
474:	learn: 0.1573703	total: 14m 6s	remaining: 15m 35s
480:	learn: 0.1573190	total: 14m 18s	remaining: 15m 25s
486:	learn: 0.1572769	total: 14m 28s	remaining: 15m 14s
492:	learn: 0.1572275	total: 14m 39s	remaining: 15m 4s
498:	learn: 0.1571720	total: 14m 52s	remaining: 14m 56s
504:	learn: 0.1571167	total: 15m 3s	remaining: 14m 45s
510:	learn: 0.1570571	total: 15m 25s	remaining: 14m 45s
516:	learn: 0.1570075	total: 15m 36s	remaining: 14m 34s
522:	learn: 0.1569611	total: 15m 50s	remaining: 14m 26s
528:	learn: 0.1569153	total: 16m	remaining: 14m 15s
534:	learn: 0.1568655	total: 16m 10s	remaining: 14m 3s
540:	learn: 0.1568157	total: 16m 21s	remaining: 13m 52s
546:	learn: 0.1567646	total: 16m 32s	remaining: 13m 41s
552:	learn: 0.1567057	total: 16m 43s	remaining: 13m 30s
558:	learn: 0.1566598	total: 16m 54s	remaining: 13m 20s
564:	learn: 0.1566191	total: 17m 5s	remaining: 13m 9s
570:	learn: 0.1565746	total: 17m 16s	remaining: 12m 58s
576:	learn: 0.1565246	total: 17m 27s	remaining: 12m 48s
582:	learn: 0.1564797	total: 17m 38s	remaining: 12m 36s
588:	learn: 0.1564422	total: 17m 47s	remaining: 12m 25s
594:	learn: 0.1563991	total: 17m 58s	remaining: 12m 13s
600:	learn: 0.1563578	total: 18m 8s	remaining: 12m 2s
606:	learn: 0.1563115	total: 18m 18s	remaining: 11m 51s
612:	learn: 0.1562715	total: 18m 29s	remaining: 11m 40s
618:	learn: 0.1562347	total: 18m 39s	remaining: 11m 29s
624:	learn: 0.1562054	total: 18m 49s	remaining: 11m 17s
630:	learn: 0.1561631	total: 18m 59s	remaining: 11m 6s
636:	learn: 0.1561227	total: 19m 9s	remaining: 10m 54s
642:	learn: 0.1560916	total: 19m 18s	remaining: 10m 43s
648:	learn: 0.1560588	total: 19m 28s	remaining: 10m 32s
654:	learn: 0.1560254	total: 19m 38s	remaining: 10m 20s
660:	learn: 0.1559886	total: 19m 47s	remaining: 10m 9s
666:	learn: 0.1559552	total: 19m 57s	remaining: 9m 57s
672:	learn: 0.1559204	total: 20m 7s	remaining: 9m 46s
678:	learn: 0.1558884	total: 20m 17s	remaining: 9m 35s
684:	learn: 0.1558572	total: 20m 27s	remaining: 9m 24s

690:	learn: 0.1558265	total: 20m 36s	remaining: 9m 12s
696:	learn: 0.1557970	total: 20m 46s	remaining: 9m 1s
702:	learn: 0.1557675	total: 20m 56s	remaining: 8m 50s
708:	learn: 0.1557317	total: 21m 6s	remaining: 8m 39s
714:	learn: 0.1557012	total: 21m 15s	remaining: 8m 28s
720:	learn: 0.1556691	total: 21m 24s	remaining: 8m 17s
726:	learn: 0.1556378	total: 21m 34s	remaining: 8m 5s
732:	learn: 0.1556063	total: 21m 44s	remaining: 7m 55s
738:	learn: 0.1555757	total: 21m 54s	remaining: 7m 44s
744:	learn: 0.1555379	total: 22m 5s	remaining: 7m 33s
750:	learn: 0.1555085	total: 22m 15s	remaining: 7m 22s
756:	learn: 0.1554764	total: 22m 26s	remaining: 7m 12s
762:	learn: 0.1554425	total: 22m 36s	remaining: 7m 1s
768:	learn: 0.1554050	total: 22m 45s	remaining: 6m 50s
774:	learn: 0.1553726	total: 22m 55s	remaining: 6m 39s
780:	learn: 0.1553354	total: 23m 4s	remaining: 6m 28s
786:	learn: 0.1553040	total: 23m 13s	remaining: 6m 17s
792:	learn: 0.1552719	total: 23m 23s	remaining: 6m 6s
798:	learn: 0.1552448	total: 23m 32s	remaining: 5m 55s
804:	learn: 0.1552152	total: 23m 49s	remaining: 5m 46s
810:	learn: 0.1551868	total: 24m 3s	remaining: 5m 36s
816:	learn: 0.1551537	total: 24m 13s	remaining: 5m 25s
822:	learn: 0.1551267	total: 24m 21s	remaining: 5m 14s
828:	learn: 0.1550999	total: 24m 31s	remaining: 5m 3s
834:	learn: 0.1550700	total: 24m 40s	remaining: 4m 52s
840:	learn: 0.1550423	total: 24m 49s	remaining: 4m 41s
846:	learn: 0.1550166	total: 24m 57s	remaining: 4m 30s
852:	learn: 0.1549922	total: 25m 6s	remaining: 4m 19s
858:	learn: 0.1549614	total: 25m 15s	remaining: 4m 8s
864:	learn: 0.1549311	total: 25m 24s	remaining: 3m 57s
870:	learn: 0.1549011	total: 25m 33s	remaining: 3m 47s
876:	learn: 0.1548728	total: 25m 42s	remaining: 3m 36s
882:	learn: 0.1548474	total: 25m 51s	remaining: 3m 25s
888:	learn: 0.1548254	total: 26m	remaining: 3m 14s
894:	learn: 0.1548016	total: 26m 8s	remaining: 3m 4s

900:	learn: 0.1547772	total: 26m 18s	remaining: 2m 53s
906:	learn: 0.1547532	total: 26m 27s	remaining: 2m 42s
912:	learn: 0.1547268	total: 26m 36s	remaining: 2m 32s
918:	learn: 0.1547065	total: 26m 45s	remaining: 2m 21s
924:	learn: 0.1546806	total: 26m 53s	remaining: 2m 10s
930:	learn: 0.1546556	total: 27m 3s	remaining: 2m
936:	learn: 0.1546320	total: 27m 12s	remaining: 1m 49s
942:	learn: 0.1546088	total: 27m 21s	remaining: 1m 39s
948:	learn: 0.1545798	total: 27m 30s	remaining: 1m 28s
954:	learn: 0.1545527	total: 27m 39s	remaining: 1m 18s
960:	learn: 0.1545279	total: 27m 48s	remaining: 1m 7s
966:	learn: 0.1545026	total: 27m 57s	remaining: 57.3s
972:	learn: 0.1544795	total: 28m 7s	remaining: 46.8s
978:	learn: 0.1544457	total: 28m 16s	remaining: 36.4s
984:	learn: 0.1544194	total: 28m 26s	remaining: 26s
990:	learn: 0.1543939	total: 28m 35s	remaining: 15.6s
996:	learn: 0.1543683	total: 28m 44s	remaining: 5.19s
999:	learn: 0.1543566	total: 28m 48s	remaining: 0us

score: 0.9371865577191034

Learning rate set to 0.170831

0:	learn: 2.2219414	total: 3.04s	remaining: 50m 36s
6:	learn: 0.7661490	total: 13.8s	remaining: 32m 33s
12:	learn: 0.3220515	total: 26.5s	remaining: 33m 32s
18:	learn: 0.2141056	total: 36.9s	remaining: 31m 47s

24:	learn: 0.1916595	total: 46.9s	remaining: 30m 27s
30:	learn: 0.1848935	total: 56.3s	remaining: 29m 19s
36:	learn: 0.1813053	total: 1m 5s	remaining: 28m 25s
42:	learn: 0.1787582	total: 1m 14s	remaining: 27m 40s
48:	learn: 0.1768786	total: 1m 23s	remaining: 27m 4s
54:	learn: 0.1750148	total: 1m 33s	remaining: 26m 42s
60:	learn: 0.1737568	total: 1m 42s	remaining: 26m 16s
66:	learn: 0.1726614	total: 1m 51s	remaining: 25m 49s
72:	learn: 0.1714493	total: 2m 5s	remaining: 26m 34s
78:	learn: 0.1705814	total: 2m 16s	remaining: 26m 31s
84:	learn: 0.1697590	total: 3m	remaining: 32m 23s
90:	learn: 0.1689619	total: 3m 8s	remaining: 31m 27s
96:	learn: 0.1682040	total: 3m 23s	remaining: 31m 35s
102:	learn: 0.1675756	total: 3m 34s	remaining: 31m 4s
108:	learn: 0.1669588	total: 3m 46s	remaining: 30m 53s
114:	learn: 0.1664279	total: 3m 58s	remaining: 30m 32s
120:	learn: 0.1659170	total: 4m 8s	remaining: 30m 3s
126:	learn: 0.1654749	total: 4m 19s	remaining: 29m 42s
132:	learn: 0.1650562	total: 4m 29s	remaining: 29m 19s
138:	learn: 0.1647292	total: 4m 39s	remaining: 28m 48s
144:	learn: 0.1643977	total: 4m 48s	remaining: 28m 24s
150:	learn: 0.1640556	total: 4m 57s	remaining: 27m 55s
156:	learn: 0.1637236	total: 5m 8s	remaining: 27m 35s
162:	learn: 0.1634102	total: 5m 18s	remaining: 27m 14s
168:	learn: 0.1631647	total: 5m 28s	remaining: 26m 54s
174:	learn: 0.1628901	total: 5m 38s	remaining: 26m 34s
180:	learn: 0.1626008	total: 5m 46s	remaining: 26m 9s
186:	learn: 0.1623379	total: 5m 56s	remaining: 25m 48s
192:	learn: 0.1621531	total: 6m 5s	remaining: 25m 29s
198:	learn: 0.1619749	total: 6m 14s	remaining: 25m 8s
204:	learn: 0.1617024	total: 6m 24s	remaining: 24m 51s
210:	learn: 0.1615015	total: 6m 34s	remaining: 24m 34s
216:	learn: 0.1613137	total: 6m 45s	remaining: 24m 23s
222:	learn: 0.1611014	total: 6m 55s	remaining: 24m 6s
228:	learn: 0.1609646	total: 7m 4s	remaining: 23m 48s
234:	learn: 0.1607475	total: 7m 14s	remaining: 23m 35s
240:	learn: 0.1605897	total: 7m 24s	remaining: 23m 19s
246:	learn: 0.1604337	total: 7m 33s	remaining: 23m 3s
252:	learn: 0.1602688	total: 7m 43s	remaining: 22m 49s
258:	learn: 0.1601304	total: 7m 53s	remaining: 22m 35s
264:	learn: 0.1599969	total: 8m 2s	remaining: 22m 19s
270:	learn: 0.1598795	total: 8m 11s	remaining: 22m 2s
276:	learn: 0.1597686	total: 8m 25s	remaining: 21m 58s
282:	learn: 0.1596621	total: 8m 36s	remaining: 21m 48s
288:	learn: 0.1595473	total: 8m 46s	remaining: 21m 34s
294:	learn: 0.1594114	total: 8m 56s	remaining: 21m 22s
300:	learn: 0.1592816	total: 9m 5s	remaining: 21m 7s
306:	learn: 0.1591871	total: 9m 14s	remaining: 20m 52s
312:	learn: 0.1590931	total: 9m 24s	remaining: 20m 39s
318:	learn: 0.1589926	total: 9m 35s	remaining: 20m 29s
324:	learn: 0.1588917	total: 9m 45s	remaining: 20m 17s
330:	learn: 0.1588057	total: 9m 55s	remaining: 20m 3s
336:	learn: 0.1586995	total: 10m 5s	remaining: 19m 51s
342:	learn: 0.1586179	total: 10m 16s	remaining: 19m 40s
348:	learn: 0.1585310	total: 10m 26s	remaining: 19m 28s
354:	learn: 0.1584461	total: 10m 35s	remaining: 19m 15s
360:	learn: 0.1583758	total: 10m 48s	remaining: 19m 7s
366:	learn: 0.1582859	total: 10m 57s	remaining: 18m 54s
372:	learn: 0.1582124	total: 11m 6s	remaining: 18m 41s
378:	learn: 0.1581435	total: 11m 15s	remaining: 18m 27s
384:	learn: 0.1580595	total: 11m 25s	remaining: 18m 14s

390:	learn: 0.1579903	total: 11m 34s	remaining: 18m 1s
396:	learn: 0.1579019	total: 11m 43s	remaining: 17m 48s
402:	learn: 0.1578277	total: 11m 52s	remaining: 17m 35s
408:	learn: 0.1577510	total: 12m 2s	remaining: 17m 23s
414:	learn: 0.1576998	total: 12m 10s	remaining: 17m 10s
420:	learn: 0.1576450	total: 12m 19s	remaining: 16m 57s
426:	learn: 0.1575719	total: 12m 29s	remaining: 16m 45s
432:	learn: 0.1575024	total: 12m 38s	remaining: 16m 32s
438:	learn: 0.1574392	total: 12m 46s	remaining: 16m 19s
444:	learn: 0.1573798	total: 12m 55s	remaining: 16m 6s
450:	learn: 0.1573273	total: 13m 4s	remaining: 15m 54s
456:	learn: 0.1572732	total: 13m 15s	remaining: 15m 44s
462:	learn: 0.1572182	total: 13m 25s	remaining: 15m 34s
468:	learn: 0.1571713	total: 13m 34s	remaining: 15m 22s
474:	learn: 0.1571127	total: 13m 43s	remaining: 15m 10s
480:	learn: 0.1570596	total: 13m 53s	remaining: 14m 59s
486:	learn: 0.1570017	total: 14m 2s	remaining: 14m 47s
492:	learn: 0.1569578	total: 14m 12s	remaining: 14m 37s
498:	learn: 0.1568994	total: 14m 23s	remaining: 14m 26s
504:	learn: 0.1568478	total: 14m 33s	remaining: 14m 16s
510:	learn: 0.1567951	total: 14m 44s	remaining: 14m 6s
516:	learn: 0.1567448	total: 14m 57s	remaining: 13m 58s
522:	learn: 0.1566873	total: 15m 8s	remaining: 13m 48s
528:	learn: 0.1566353	total: 15m 19s	remaining: 13m 39s
534:	learn: 0.1565987	total: 15m 29s	remaining: 13m 27s
540:	learn: 0.1565583	total: 15m 38s	remaining: 13m 16s
546:	learn: 0.1565226	total: 15m 47s	remaining: 13m 4s
552:	learn: 0.1564698	total: 15m 58s	remaining: 12m 54s
558:	learn: 0.1564300	total: 16m 8s	remaining: 12m 43s
564:	learn: 0.1563870	total: 16m 18s	remaining: 12m 33s
570:	learn: 0.1563469	total: 16m 28s	remaining: 12m 22s
576:	learn: 0.1562911	total: 16m 39s	remaining: 12m 12s
582:	learn: 0.1562445	total: 16m 51s	remaining: 12m 3s
588:	learn: 0.1562098	total: 17m 1s	remaining: 11m 52s
594:	learn: 0.1561713	total: 17m 11s	remaining: 11m 41s
600:	learn: 0.1561303	total: 17m 21s	remaining: 11m 31s
606:	learn: 0.1560933	total: 17m 31s	remaining: 11m 20s
612:	learn: 0.1560558	total: 17m 41s	remaining: 11m 10s
618:	learn: 0.1560204	total: 17m 55s	remaining: 11m 1s
624:	learn: 0.1559828	total: 18m 6s	remaining: 10m 52s
630:	learn: 0.1559443	total: 18m 16s	remaining: 10m 41s
636:	learn: 0.1559088	total: 18m 26s	remaining: 10m 30s
642:	learn: 0.1558754	total: 18m 35s	remaining: 10m 19s
648:	learn: 0.1558394	total: 18m 45s	remaining: 10m 8s
654:	learn: 0.1558011	total: 18m 55s	remaining: 9m 57s
660:	learn: 0.1557670	total: 19m 4s	remaining: 9m 47s
666:	learn: 0.1557275	total: 19m 14s	remaining: 9m 36s
672:	learn: 0.1556979	total: 19m 24s	remaining: 9m 25s
678:	learn: 0.1556689	total: 19m 34s	remaining: 9m 15s
684:	learn: 0.1556256	total: 19m 44s	remaining: 9m 4s
690:	learn: 0.1555876	total: 19m 53s	remaining: 8m 53s
696:	learn: 0.1555565	total: 20m 3s	remaining: 8m 43s
702:	learn: 0.1555182	total: 20m 13s	remaining: 8m 32s
708:	learn: 0.1554848	total: 20m 22s	remaining: 8m 21s
714:	learn: 0.1554529	total: 20m 32s	remaining: 8m 11s
720:	learn: 0.1554182	total: 20m 41s	remaining: 8m
726:	learn: 0.1553934	total: 20m 51s	remaining: 7m 50s
732:	learn: 0.1553597	total: 21m 2s	remaining: 7m 39s
738:	learn: 0.1553304	total: 21m 12s	remaining: 7m 29s
744:	learn: 0.1553046	total: 21m 21s	remaining: 7m 18s
750:	learn: 0.1552800	total: 21m 30s	remaining: 7m 7s

756:	learn: 0.1552510	total: 21m 40s	remaining: 6m 57s
762:	learn: 0.1552179	total: 21m 49s	remaining: 6m 46s
768:	learn: 0.1551867	total: 21m 58s	remaining: 6m 36s
774:	learn: 0.1551459	total: 22m 9s	remaining: 6m 25s
780:	learn: 0.1551148	total: 22m 18s	remaining: 6m 15s

786:	learn: 0.1550926	total: 22m 27s	remaining: 6m 4s
792:	learn: 0.1550663	total: 22m 36s	remaining: 5m 54s
798:	learn: 0.1550421	total: 22m 44s	remaining: 5m 43s
804:	learn: 0.1550128	total: 22m 54s	remaining: 5m 32s
810:	learn: 0.1549861	total: 23m 3s	remaining: 5m 22s
816:	learn: 0.1549538	total: 23m 12s	remaining: 5m 11s
822:	learn: 0.1549220	total: 23m 22s	remaining: 5m 1s
828:	learn: 0.1548886	total: 23m 31s	remaining: 4m 51s
834:	learn: 0.1548630	total: 23m 41s	remaining: 4m 40s
840:	learn: 0.1548343	total: 23m 50s	remaining: 4m 30s
846:	learn: 0.1548055	total: 23m 59s	remaining: 4m 19s
852:	learn: 0.1547770	total: 24m 8s	remaining: 4m 9s
858:	learn: 0.1547456	total: 24m 17s	remaining: 3m 59s
864:	learn: 0.1547218	total: 24m 26s	remaining: 3m 48s
870:	learn: 0.1546905	total: 24m 35s	remaining: 3m 38s
876:	learn: 0.1546628	total: 24m 44s	remaining: 3m 28s
882:	learn: 0.1546406	total: 24m 54s	remaining: 3m 18s
888:	learn: 0.1546163	total: 25m 5s	remaining: 3m 7s
894:	learn: 0.1545899	total: 25m 15s	remaining: 2m 57s
900:	learn: 0.1545624	total: 25m 25s	remaining: 2m 47s
906:	learn: 0.1545381	total: 25m 34s	remaining: 2m 37s
912:	learn: 0.1545102	total: 25m 44s	remaining: 2m 27s
918:	learn: 0.1544886	total: 25m 54s	remaining: 2m 17s
924:	learn: 0.1544640	total: 26m 4s	remaining: 2m 6s
930:	learn: 0.1544335	total: 26m 15s	remaining: 1m 56s
936:	learn: 0.1544071	total: 26m 25s	remaining: 1m 46s
942:	learn: 0.1543842	total: 26m 35s	remaining: 1m 36s
948:	learn: 0.1543554	total: 26m 46s	remaining: 1m 26s
954:	learn: 0.1543303	total: 26m 57s	remaining: 1m 16s
960:	learn: 0.1543030	total: 27m 7s	remaining: 1m 6s
966:	learn: 0.1542803	total: 27m 17s	remaining: 55.9s
972:	learn: 0.1542573	total: 27m 27s	remaining: 45.7s
978:	learn: 0.1542368	total: 27m 37s	remaining: 35.5s
984:	learn: 0.1542124	total: 27m 46s	remaining: 25.4s
990:	learn: 0.1541839	total: 27m 56s	remaining: 15.2s
996:	learn: 0.1541607	total: 28m 5s	remaining: 5.07s
999:	learn: 0.1541452	total: 28m 9s	remaining: 0us

score: 0.9376375428874532

Learning rate set to 0.170831

0:	learn: 2.2215691	total: 2.89s	remaining: 48m 8s
6:	learn: 0.7663684	total: 14s	remaining: 33m 2s
12:	learn: 0.3242864	total: 25.4s	remaining: 32m 10s
18:	learn: 0.2157687	total: 35.8s	remaining: 30m 49s
24:	learn: 0.1935523	total: 45.8s	remaining: 29m 46s
30:	learn: 0.1863725	total: 1m 1s	remaining: 32m 12s
36:	learn: 0.1827724	total: 1m 12s	remaining: 31m 19s
42:	learn: 0.1801395	total: 1m 23s	remaining: 30m 50s
48:	learn: 0.1778804	total: 1m 33s	remaining: 30m 17s
54:	learn: 0.1761513	total: 1m 44s	remaining: 29m 56s
60:	learn: 0.1745024	total: 1m 54s	remaining: 29m 27s
66:	learn: 0.1732703	total: 2m 5s	remaining: 29m 3s
72:	learn: 0.1721596	total: 2m 15s	remaining: 28m 36s
78:	learn: 0.1712589	total: 2m 27s	remaining: 28m 36s
84:	learn: 0.1702851	total: 2m 38s	remaining: 28m 27s
90:	learn: 0.1695211	total: 2m 49s	remaining: 28m 12s

96:	learn: 0.1687451	total: 3m	remaining: 27m 57s
102:	learn: 0.1681550	total: 3m 10s	remaining: 27m 40s
108:	learn: 0.1675873	total: 3m 20s	remaining: 27m 22s
114:	learn: 0.1670717	total: 3m 32s	remaining: 27m 14s
120:	learn: 0.1665629	total: 3m 43s	remaining: 27m 6s
126:	learn: 0.1660964	total: 3m 56s	remaining: 27m 3s
132:	learn: 0.1656705	total: 4m 11s	remaining: 27m 21s
138:	learn: 0.1651690	total: 4m 24s	remaining: 27m 17s
144:	learn: 0.1646985	total: 4m 36s	remaining: 27m 10s
150:	learn: 0.1643441	total: 4m 48s	remaining: 26m 59s
156:	learn: 0.1639808	total: 4m 59s	remaining: 26m 48s
162:	learn: 0.1637064	total: 5m 11s	remaining: 26m 40s
168:	learn: 0.1634585	total: 5m 23s	remaining: 26m 29s
174:	learn: 0.1631875	total: 5m 39s	remaining: 26m 40s
180:	learn: 0.1629000	total: 5m 49s	remaining: 26m 22s
186:	learn: 0.1625759	total: 6m 2s	remaining: 26m 16s
192:	learn: 0.1622978	total: 6m 15s	remaining: 26m 9s
198:	learn: 0.1620617	total: 6m 25s	remaining: 25m 53s
204:	learn: 0.1618659	total: 6m 35s	remaining: 25m 35s
210:	learn: 0.1616398	total: 6m 45s	remaining: 25m 17s
216:	learn: 0.1614446	total: 6m 56s	remaining: 25m 1s
222:	learn: 0.1612544	total: 7m 5s	remaining: 24m 44s
228:	learn: 0.1611022	total: 7m 15s	remaining: 24m 26s
234:	learn: 0.1609237	total: 7m 25s	remaining: 24m 10s
240:	learn: 0.1607609	total: 7m 35s	remaining: 23m 53s
246:	learn: 0.1606118	total: 7m 44s	remaining: 23m 37s
252:	learn: 0.1604794	total: 7m 56s	remaining: 23m 25s
258:	learn: 0.1603044	total: 8m 8s	remaining: 23m 17s
264:	learn: 0.1601434	total: 8m 19s	remaining: 23m 4s
270:	learn: 0.1600037	total: 8m 32s	remaining: 22m 57s
276:	learn: 0.1598743	total: 8m 44s	remaining: 22m 48s
282:	learn: 0.1597633	total: 8m 53s	remaining: 22m 31s
288:	learn: 0.1596418	total: 9m 2s	remaining: 22m 15s
294:	learn: 0.1595107	total: 9m 13s	remaining: 22m 2s
300:	learn: 0.1594032	total: 9m 22s	remaining: 21m 47s
306:	learn: 0.1592811	total: 9m 36s	remaining: 21m 40s
312:	learn: 0.1591767	total: 9m 47s	remaining: 21m 30s
318:	learn: 0.1590730	total: 9m 58s	remaining: 21m 17s
324:	learn: 0.1589805	total: 10m 18s	remaining: 21m 24s
330:	learn: 0.1589021	total: 10m 29s	remaining: 21m 12s
336:	learn: 0.1588146	total: 10m 40s	remaining: 20m 59s
342:	learn: 0.1587256	total: 10m 51s	remaining: 20m 48s
348:	learn: 0.1586345	total: 11m 5s	remaining: 20m 42s
354:	learn: 0.1585597	total: 11m 17s	remaining: 20m 30s
360:	learn: 0.1584844	total: 11m 27s	remaining: 20m 17s
366:	learn: 0.1584120	total: 11m 38s	remaining: 20m 4s
372:	learn: 0.1583358	total: 11m 47s	remaining: 19m 49s
378:	learn: 0.1582359	total: 11m 57s	remaining: 19m 35s
384:	learn: 0.1581509	total: 12m 7s	remaining: 19m 21s
390:	learn: 0.1580701	total: 12m 17s	remaining: 19m 8s
396:	learn: 0.1580028	total: 12m 28s	remaining: 18m 57s
402:	learn: 0.1579469	total: 12m 39s	remaining: 18m 44s
408:	learn: 0.1578557	total: 12m 49s	remaining: 18m 31s
414:	learn: 0.1577876	total: 12m 59s	remaining: 18m 19s
420:	learn: 0.1577301	total: 13m 8s	remaining: 18m 5s
426:	learn: 0.1576511	total: 13m 18s	remaining: 17m 51s
432:	learn: 0.1575811	total: 13m 27s	remaining: 17m 37s
438:	learn: 0.1575225	total: 13m 37s	remaining: 17m 24s
444:	learn: 0.1574704	total: 13m 50s	remaining: 17m 16s
450:	learn: 0.1574074	total: 14m 1s	remaining: 17m 4s
456:	learn: 0.1573503	total: 14m 15s	remaining: 16m 56s

462:	learn: 0.1572960	total: 14m 31s	remaining: 16m 50s
468:	learn: 0.1572430	total: 14m 40s	remaining: 16m 37s
474:	learn: 0.1571923	total: 14m 50s	remaining: 16m 23s
480:	learn: 0.1571422	total: 15m 1s	remaining: 16m 12s
486:	learn: 0.1570961	total: 15m 10s	remaining: 15m 59s
492:	learn: 0.1570368	total: 15m 23s	remaining: 15m 49s
498:	learn: 0.1569893	total: 15m 33s	remaining: 15m 37s
504:	learn: 0.1569433	total: 15m 44s	remaining: 15m 25s
510:	learn: 0.1568807	total: 15m 54s	remaining: 15m 13s
516:	learn: 0.1568310	total: 16m 5s	remaining: 15m 2s
522:	learn: 0.1567880	total: 16m 16s	remaining: 14m 50s
528:	learn: 0.1567416	total: 16m 25s	remaining: 14m 37s
534:	learn: 0.1566951	total: 16m 35s	remaining: 14m 25s
540:	learn: 0.1566498	total: 16m 46s	remaining: 14m 13s
546:	learn: 0.1566092	total: 16m 55s	remaining: 14m 1s
552:	learn: 0.1565713	total: 17m 4s	remaining: 13m 48s
558:	learn: 0.1565292	total: 17m 14s	remaining: 13m 36s
564:	learn: 0.1564853	total: 17m 24s	remaining: 13m 24s
570:	learn: 0.1564418	total: 17m 35s	remaining: 13m 12s
576:	learn: 0.1563984	total: 17m 45s	remaining: 13m
582:	learn: 0.1563392	total: 17m 55s	remaining: 12m 49s
588:	learn: 0.1562984	total: 18m 5s	remaining: 12m 37s
594:	learn: 0.1562596	total: 18m 14s	remaining: 12m 25s
600:	learn: 0.1562223	total: 18m 24s	remaining: 12m 13s
606:	learn: 0.1561799	total: 18m 34s	remaining: 12m 1s
612:	learn: 0.1561489	total: 18m 43s	remaining: 11m 49s
618:	learn: 0.1561143	total: 18m 53s	remaining: 11m 37s
624:	learn: 0.1560724	total: 19m 4s	remaining: 11m 26s
630:	learn: 0.1560390	total: 19m 13s	remaining: 11m 14s
636:	learn: 0.1559980	total: 19m 23s	remaining: 11m 2s
642:	learn: 0.1559641	total: 19m 32s	remaining: 10m 51s
648:	learn: 0.1559194	total: 19m 43s	remaining: 10m 40s
654:	learn: 0.1558810	total: 19m 52s	remaining: 10m 28s
660:	learn: 0.1558451	total: 20m 2s	remaining: 10m 16s
666:	learn: 0.1558119	total: 20m 12s	remaining: 10m 5s

672:	learn: 0.1557859	total: 20m 22s	remaining: 9m 53s
678:	learn: 0.1557515	total: 20m 32s	remaining: 9m 42s
684:	learn: 0.1557120	total: 20m 42s	remaining: 9m 31s
690:	learn: 0.1556802	total: 20m 52s	remaining: 9m 20s
696:	learn: 0.1556359	total: 21m 2s	remaining: 9m 8s
702:	learn: 0.1555956	total: 21m 12s	remaining: 8m 57s
708:	learn: 0.1555634	total: 21m 21s	remaining: 8m 46s
714:	learn: 0.1555348	total: 21m 31s	remaining: 8m 34s
720:	learn: 0.1555080	total: 21m 40s	remaining: 8m 23s
726:	learn: 0.1554748	total: 21m 50s	remaining: 8m 12s
732:	learn: 0.1554367	total: 22m 1s	remaining: 8m 1s
738:	learn: 0.1554063	total: 22m 11s	remaining: 7m 50s
744:	learn: 0.1553768	total: 22m 21s	remaining: 7m 39s
750:	learn: 0.1553428	total: 22m 34s	remaining: 7m 29s
756:	learn: 0.1553109	total: 22m 46s	remaining: 7m 18s
762:	learn: 0.1552804	total: 22m 58s	remaining: 7m 8s
768:	learn: 0.1552489	total: 23m 8s	remaining: 6m 57s
774:	learn: 0.1552193	total: 23m 22s	remaining: 6m 47s
780:	learn: 0.1551874	total: 23m 32s	remaining: 6m 36s
786:	learn: 0.1551564	total: 23m 43s	remaining: 6m 25s
792:	learn: 0.1551308	total: 23m 53s	remaining: 6m 14s
798:	learn: 0.1551064	total: 24m 3s	remaining: 6m 3s
804:	learn: 0.1550780	total: 24m 13s	remaining: 5m 52s
810:	learn: 0.1550472	total: 24m 24s	remaining: 5m 41s
816:	learn: 0.1550141	total: 24m 34s	remaining: 5m 30s

822:	learn: 0.1549857	total: 24m 44s	remaining: 5m 19s
828:	learn: 0.1549571	total: 24m 54s	remaining: 5m 8s
834:	learn: 0.1549282	total: 25m 3s	remaining: 4m 57s
840:	learn: 0.1548997	total: 25m 13s	remaining: 4m 46s
846:	learn: 0.1548715	total: 25m 23s	remaining: 4m 35s
852:	learn: 0.1548465	total: 25m 33s	remaining: 4m 24s
858:	learn: 0.1548238	total: 25m 42s	remaining: 4m 13s
864:	learn: 0.1547876	total: 25m 52s	remaining: 4m 2s
870:	learn: 0.1547629	total: 26m 2s	remaining: 3m 51s
876:	learn: 0.1547367	total: 26m 12s	remaining: 3m 40s
882:	learn: 0.1547111	total: 26m 23s	remaining: 3m 29s
888:	learn: 0.1546836	total: 26m 33s	remaining: 3m 19s
894:	learn: 0.1546563	total: 26m 43s	remaining: 3m 8s
900:	learn: 0.1546283	total: 26m 53s	remaining: 2m 57s
906:	learn: 0.1546048	total: 27m 3s	remaining: 2m 46s
912:	learn: 0.1545830	total: 27m 13s	remaining: 2m 35s
918:	learn: 0.1545593	total: 27m 22s	remaining: 2m 24s
924:	learn: 0.1545375	total: 27m 32s	remaining: 2m 13s
930:	learn: 0.1545112	total: 27m 41s	remaining: 2m 3s
936:	learn: 0.1544875	total: 27m 50s	remaining: 1m 52s
942:	learn: 0.1544625	total: 28m	remaining: 1m 41s
948:	learn: 0.1544339	total: 28m 10s	remaining: 1m 30s
954:	learn: 0.1544126	total: 28m 19s	remaining: 1m 20s
960:	learn: 0.1543852	total: 28m 30s	remaining: 1m 9s
966:	learn: 0.1543630	total: 28m 40s	remaining: 58.7s
972:	learn: 0.1543381	total: 28m 49s	remaining: 48s
978:	learn: 0.1543168	total: 28m 59s	remaining: 37.3s
984:	learn: 0.1542970	total: 29m 9s	remaining: 26.6s
990:	learn: 0.1542707	total: 29m 20s	remaining: 16s
996:	learn: 0.1542531	total: 29m 29s	remaining: 5.32s
999:	learn: 0.1542433	total: 29m 34s	remaining: 0us

score: 0.9372374987450738

Learning rate set to 0.170831

0:	learn: 2.2218742	total: 2.89s	remaining: 48m 8s
6:	learn: 0.7700497	total: 16.5s	remaining: 39m 4s
12:	learn: 0.3236454	total: 28.7s	remaining: 36m 22s
18:	learn: 0.2168331	total: 41.1s	remaining: 35m 22s
24:	learn: 0.1946197	total: 53.3s	remaining: 34m 37s
30:	learn: 0.1868101	total: 1m 4s	remaining: 33m 39s
36:	learn: 0.1826906	total: 1m 15s	remaining: 32m 44s
42:	learn: 0.1802648	total: 1m 28s	remaining: 32m 48s
48:	learn: 0.1780630	total: 1m 40s	remaining: 32m 28s
54:	learn: 0.1760874	total: 1m 51s	remaining: 31m 50s
60:	learn: 0.1747329	total: 2m	remaining: 30m 56s
66:	learn: 0.1733901	total: 2m 10s	remaining: 30m 22s
72:	learn: 0.1724176	total: 2m 22s	remaining: 30m 11s
78:	learn: 0.1713951	total: 2m 33s	remaining: 29m 53s
84:	learn: 0.1706121	total: 2m 43s	remaining: 29m 23s
90:	learn: 0.1698337	total: 2m 53s	remaining: 28m 52s
96:	learn: 0.1689868	total: 3m 3s	remaining: 28m 28s
102:	learn: 0.1683568	total: 3m 12s	remaining: 28m
108:	learn: 0.1678254	total: 3m 22s	remaining: 27m 37s
114:	learn: 0.1672466	total: 3m 32s	remaining: 27m 17s
120:	learn: 0.1667562	total: 3m 43s	remaining: 27m
126:	learn: 0.1663791	total: 3m 52s	remaining: 26m 39s
132:	learn: 0.1659670	total: 4m 3s	remaining: 26m 29s
138:	learn: 0.1655722	total: 4m 13s	remaining: 26m 10s
144:	learn: 0.1651974	total: 4m 23s	remaining: 25m 55s
150:	learn: 0.1648448	total: 4m 33s	remaining: 25m 36s
156:	learn: 0.1645755	total: 4m 43s	remaining: 25m 20s
162:	learn: 0.1641837	total: 4m 53s	remaining: 25m 5s

168:	learn: 0.1638877	total: 5m 3s	remaining: 24m 50s
174:	learn: 0.1636405	total: 5m 13s	remaining: 24m 38s
180:	learn: 0.1632769	total: 5m 23s	remaining: 24m 25s
186:	learn: 0.1630264	total: 5m 32s	remaining: 24m 7s
192:	learn: 0.1627969	total: 5m 44s	remaining: 24m 2s
198:	learn: 0.1625406	total: 5m 57s	remaining: 23m 57s
204:	learn: 0.1622804	total: 6m 6s	remaining: 23m 41s
210:	learn: 0.1620881	total: 6m 15s	remaining: 23m 23s
216:	learn: 0.1618621	total: 6m 25s	remaining: 23m 10s
222:	learn: 0.1616705	total: 6m 34s	remaining: 22m 55s
228:	learn: 0.1614601	total: 6m 43s	remaining: 22m 39s
234:	learn: 0.1613131	total: 6m 53s	remaining: 22m 25s
240:	learn: 0.1611421	total: 7m 2s	remaining: 22m 10s
246:	learn: 0.1609980	total: 7m 11s	remaining: 21m 55s
252:	learn: 0.1608308	total: 7m 20s	remaining: 21m 40s
258:	learn: 0.1606852	total: 7m 30s	remaining: 21m 27s
264:	learn: 0.1605435	total: 7m 39s	remaining: 21m 13s
270:	learn: 0.1603787	total: 7m 48s	remaining: 21m
276:	learn: 0.1602563	total: 7m 57s	remaining: 20m 46s
282:	learn: 0.1601302	total: 8m 6s	remaining: 20m 33s
288:	learn: 0.1600158	total: 8m 16s	remaining: 20m 20s
294:	learn: 0.1598944	total: 8m 24s	remaining: 20m 6s
300:	learn: 0.1597873	total: 8m 34s	remaining: 19m 53s
306:	learn: 0.1596591	total: 8m 42s	remaining: 19m 40s
312:	learn: 0.1595487	total: 8m 52s	remaining: 19m 27s
318:	learn: 0.1594353	total: 9m 1s	remaining: 19m 16s
324:	learn: 0.1593459	total: 9m 10s	remaining: 19m 3s
330:	learn: 0.1592509	total: 9m 19s	remaining: 18m 51s
336:	learn: 0.1591627	total: 9m 29s	remaining: 18m 39s
342:	learn: 0.1590596	total: 9m 38s	remaining: 18m 27s
348:	learn: 0.1589857	total: 9m 46s	remaining: 18m 14s
354:	learn: 0.1588999	total: 9m 55s	remaining: 18m 2s
360:	learn: 0.1588258	total: 10m 4s	remaining: 17m 50s
366:	learn: 0.1587509	total: 10m 13s	remaining: 17m 37s
372:	learn: 0.1586507	total: 10m 23s	remaining: 17m 27s
378:	learn: 0.1585834	total: 10m 31s	remaining: 17m 15s
384:	learn: 0.1585051	total: 10m 41s	remaining: 17m 4s
390:	learn: 0.1584359	total: 10m 51s	remaining: 16m 54s
396:	learn: 0.1583621	total: 11m	remaining: 16m 43s
402:	learn: 0.1582773	total: 11m 10s	remaining: 16m 33s
408:	learn: 0.1582134	total: 11m 19s	remaining: 16m 22s
414:	learn: 0.1581476	total: 11m 29s	remaining: 16m 11s
420:	learn: 0.1580756	total: 11m 39s	remaining: 16m 1s
426:	learn: 0.1580116	total: 11m 48s	remaining: 15m 50s
432:	learn: 0.1579384	total: 11m 57s	remaining: 15m 39s
438:	learn: 0.1578886	total: 12m 6s	remaining: 15m 27s
444:	learn: 0.1578413	total: 12m 15s	remaining: 15m 16s
450:	learn: 0.1577848	total: 12m 24s	remaining: 15m 5s
456:	learn: 0.1577260	total: 12m 33s	remaining: 14m 55s
462:	learn: 0.1576665	total: 12m 42s	remaining: 14m 44s
468:	learn: 0.1576058	total: 12m 51s	remaining: 14m 33s
474:	learn: 0.1575514	total: 13m	remaining: 14m 22s
480:	learn: 0.1574853	total: 13m 10s	remaining: 14m 13s
486:	learn: 0.1574379	total: 13m 19s	remaining: 14m 2s
492:	learn: 0.1573821	total: 13m 28s	remaining: 13m 51s
498:	learn: 0.1573458	total: 13m 38s	remaining: 13m 41s
504:	learn: 0.1573000	total: 13m 46s	remaining: 13m 30s
510:	learn: 0.1572474	total: 13m 55s	remaining: 13m 19s
516:	learn: 0.1571944	total: 14m 5s	remaining: 13m 9s
522:	learn: 0.1571474	total: 14m 14s	remaining: 12m 59s
528:	learn: 0.1570865	total: 14m 23s	remaining: 12m 49s

534:	learn: 0.1570376	total: 14m 33s	remaining: 12m 38s
540:	learn: 0.1569953	total: 14m 42s	remaining: 12m 28s
546:	learn: 0.1569506	total: 14m 50s	remaining: 12m 17s
552:	learn: 0.1568971	total: 14m 59s	remaining: 12m 7s
558:	learn: 0.1568437	total: 15m 9s	remaining: 11m 57s
564:	learn: 0.1567914	total: 15m 18s	remaining: 11m 47s
570:	learn: 0.1567522	total: 15m 28s	remaining: 11m 37s
576:	learn: 0.1567110	total: 15m 37s	remaining: 11m 27s
582:	learn: 0.1566718	total: 15m 46s	remaining: 11m 17s
588:	learn: 0.1566257	total: 15m 56s	remaining: 11m 7s
594:	learn: 0.1565881	total: 16m 5s	remaining: 10m 56s
600:	learn: 0.1565467	total: 16m 18s	remaining: 10m 49s
606:	learn: 0.1565100	total: 16m 28s	remaining: 10m 40s
612:	learn: 0.1564770	total: 16m 37s	remaining: 10m 29s
618:	learn: 0.1564442	total: 16m 46s	remaining: 10m 19s
624:	learn: 0.1564093	total: 16m 55s	remaining: 10m 9s
630:	learn: 0.1563734	total: 17m 3s	remaining: 9m 58s
636:	learn: 0.1563368	total: 17m 12s	remaining: 9m 48s
642:	learn: 0.1562938	total: 17m 21s	remaining: 9m 38s
648:	learn: 0.1562488	total: 17m 31s	remaining: 9m 28s
654:	learn: 0.1562097	total: 17m 40s	remaining: 9m 18s
660:	learn: 0.1561668	total: 17m 49s	remaining: 9m 8s
666:	learn: 0.1561234	total: 17m 59s	remaining: 8m 58s
672:	learn: 0.1560870	total: 18m 7s	remaining: 8m 48s
678:	learn: 0.1560487	total: 18m 16s	remaining: 8m 38s
684:	learn: 0.1560137	total: 18m 26s	remaining: 8m 28s
690:	learn: 0.1559798	total: 18m 36s	remaining: 8m 19s
696:	learn: 0.1559523	total: 18m 48s	remaining: 8m 10s
702:	learn: 0.1559186	total: 18m 59s	remaining: 8m 1s
708:	learn: 0.1558837	total: 19m 10s	remaining: 7m 52s
714:	learn: 0.1558545	total: 19m 19s	remaining: 7m 42s
720:	learn: 0.1558224	total: 19m 27s	remaining: 7m 31s
726:	learn: 0.1557880	total: 19m 36s	remaining: 7m 21s
732:	learn: 0.1557573	total: 19m 46s	remaining: 7m 12s
738:	learn: 0.1557285	total: 19m 55s	remaining: 7m 2s
744:	learn: 0.1556963	total: 20m 4s	remaining: 6m 52s
750:	learn: 0.1556646	total: 20m 13s	remaining: 6m 42s
756:	learn: 0.1556369	total: 20m 23s	remaining: 6m 32s
762:	learn: 0.1556032	total: 20m 32s	remaining: 6m 22s
768:	learn: 0.1555689	total: 20m 41s	remaining: 6m 12s
774:	learn: 0.1555377	total: 20m 51s	remaining: 6m 3s
780:	learn: 0.1555073	total: 21m	remaining: 5m 53s
786:	learn: 0.1554782	total: 21m 10s	remaining: 5m 43s
792:	learn: 0.1554490	total: 21m 19s	remaining: 5m 33s
798:	learn: 0.1554193	total: 21m 28s	remaining: 5m 24s
804:	learn: 0.1553924	total: 21m 36s	remaining: 5m 14s
810:	learn: 0.1553661	total: 21m 45s	remaining: 5m 4s
816:	learn: 0.1553421	total: 21m 54s	remaining: 4m 54s
822:	learn: 0.1553168	total: 22m 3s	remaining: 4m 44s
828:	learn: 0.1552854	total: 22m 12s	remaining: 4m 34s
834:	learn: 0.1552578	total: 22m 21s	remaining: 4m 25s
840:	learn: 0.1552365	total: 22m 30s	remaining: 4m 15s
846:	learn: 0.1552081	total: 22m 39s	remaining: 4m 5s
852:	learn: 0.1551735	total: 22m 49s	remaining: 3m 56s
858:	learn: 0.1551468	total: 22m 58s	remaining: 3m 46s
864:	learn: 0.1551235	total: 23m 7s	remaining: 3m 36s
870:	learn: 0.1550955	total: 23m 16s	remaining: 3m 26s
876:	learn: 0.1550694	total: 23m 25s	remaining: 3m 17s
882:	learn: 0.1550458	total: 23m 34s	remaining: 3m 7s

888:	learn: 0.1550182	total: 23m 43s	remaining: 2m 57s
894:	learn: 0.1549940	total: 23m 53s	remaining: 2m 48s
900:	learn: 0.1549667	total: 24m 1s	remaining: 2m 38s
906:	learn: 0.1549398	total: 24m 10s	remaining: 2m 28s
912:	learn: 0.1549097	total: 24m 19s	remaining: 2m 19s
918:	learn: 0.1548870	total: 24m 28s	remaining: 2m 9s
924:	learn: 0.1548588	total: 24m 38s	remaining: 1m 59s
930:	learn: 0.1548367	total: 24m 47s	remaining: 1m 50s
936:	learn: 0.1548128	total: 24m 55s	remaining: 1m 40s
942:	learn: 0.1547897	total: 25m 4s	remaining: 1m 30s
948:	learn: 0.1547654	total: 25m 13s	remaining: 1m 21s
954:	learn: 0.1547409	total: 25m 22s	remaining: 1m 11s
960:	learn: 0.1547143	total: 25m 31s	remaining: 1m 2s
966:	learn: 0.1546917	total: 25m 40s	remaining: 52.6s
972:	learn: 0.1546654	total: 25m 49s	remaining: 43s
978:	learn: 0.1546412	total: 25m 58s	remaining: 33.4s
984:	learn: 0.1546214	total: 26m 7s	remaining: 23.9s
990:	learn: 0.1545954	total: 26m 16s	remaining: 14.3s
996:	learn: 0.1545706	total: 26m 25s	remaining: 4.77s
999:	learn: 0.1545593	total: 26m 30s	remaining: 0us

score: 0.9391311571580853

Learning rate set to 0.170831

0:	learn: 2.2213660	total: 2.23s	remaining: 37m 4s
6:	learn: 0.7700193	total: 13.4s	remaining: 31m 41s
12:	learn: 0.3229014	total: 23.5s	remaining: 29m 46s
18:	learn: 0.2149660	total: 33.8s	remaining: 29m 6s
24:	learn: 0.1928806	total: 43.4s	remaining: 28m 13s
30:	learn: 0.1855252	total: 53.4s	remaining: 27m 48s
36:	learn: 0.1818316	total: 1m 2s	remaining: 27m 8s
42:	learn: 0.1796417	total: 1m 11s	remaining: 26m 36s
48:	learn: 0.1777782	total: 1m 20s	remaining: 26m 9s
54:	learn: 0.1761261	total: 1m 30s	remaining: 25m 51s
60:	learn: 0.1749315	total: 1m 39s	remaining: 25m 26s
66:	learn: 0.1738600	total: 1m 48s	remaining: 25m 7s
72:	learn: 0.1728002	total: 1m 57s	remaining: 24m 53s
78:	learn: 0.1717957	total: 2m 7s	remaining: 24m 41s
84:	learn: 0.1710589	total: 2m 16s	remaining: 24m 25s
90:	learn: 0.1701621	total: 2m 24s	remaining: 24m 7s
96:	learn: 0.1695362	total: 2m 34s	remaining: 23m 54s
102:	learn: 0.1688965	total: 2m 43s	remaining: 23m 42s
108:	learn: 0.1683489	total: 2m 52s	remaining: 23m 27s
114:	learn: 0.1677332	total: 3m 2s	remaining: 23m 21s
120:	learn: 0.1672826	total: 3m 11s	remaining: 23m 9s
126:	learn: 0.1669276	total: 3m 20s	remaining: 22m 57s
132:	learn: 0.1665163	total: 3m 29s	remaining: 22m 46s
138:	learn: 0.1661589	total: 3m 39s	remaining: 22m 36s
144:	learn: 0.1657530	total: 3m 48s	remaining: 22m 27s
150:	learn: 0.1653938	total: 3m 57s	remaining: 22m 17s
156:	learn: 0.1650784	total: 4m 6s	remaining: 22m 4s
162:	learn: 0.1647305	total: 4m 15s	remaining: 21m 51s
168:	learn: 0.1644281	total: 4m 24s	remaining: 21m 42s
174:	learn: 0.1640928	total: 4m 34s	remaining: 21m 32s
180:	learn: 0.1637997	total: 4m 43s	remaining: 21m 22s
186:	learn: 0.1635434	total: 4m 52s	remaining: 21m 12s
192:	learn: 0.1632872	total: 5m 1s	remaining: 21m 2s
198:	learn: 0.1630252	total: 5m 11s	remaining: 20m 54s
204:	learn: 0.1628005	total: 5m 20s	remaining: 20m 43s
210:	learn: 0.1626242	total: 5m 29s	remaining: 20m 31s
216:	learn: 0.1624010	total: 5m 45s	remaining: 20m 45s
222:	learn: 0.1621727	total: 5m 56s	remaining: 20m 40s
228:	learn: 0.1619617	total: 6m 11s	remaining: 20m 49s

234:	learn: 0.1617925	total: 6m 22s	remaining: 20m 44s
240:	learn: 0.1616168	total: 6m 31s	remaining: 20m 33s
246:	learn: 0.1614386	total: 6m 41s	remaining: 20m 24s
252:	learn: 0.1613175	total: 6m 50s	remaining: 20m 11s
258:	learn: 0.1611592	total: 7m 2s	remaining: 20m 7s
264:	learn: 0.1610123	total: 7m 14s	remaining: 20m 5s
270:	learn: 0.1608880	total: 7m 27s	remaining: 20m 3s
276:	learn: 0.1607542	total: 7m 36s	remaining: 19m 52s
282:	learn: 0.1606119	total: 7m 47s	remaining: 19m 44s
288:	learn: 0.1604986	total: 7m 58s	remaining: 19m 36s
294:	learn: 0.1603605	total: 8m 8s	remaining: 19m 26s
300:	learn: 0.1602269	total: 8m 17s	remaining: 19m 16s
306:	learn: 0.1601258	total: 8m 27s	remaining: 19m 6s
312:	learn: 0.1600317	total: 8m 38s	remaining: 18m 57s
318:	learn: 0.1599365	total: 8m 49s	remaining: 18m 50s
324:	learn: 0.1597824	total: 9m	remaining: 18m 42s
330:	learn: 0.1596936	total: 9m 10s	remaining: 18m 32s
336:	learn: 0.1596092	total: 9m 21s	remaining: 18m 24s
342:	learn: 0.1595254	total: 9m 35s	remaining: 18m 22s
348:	learn: 0.1594338	total: 9m 45s	remaining: 18m 12s
354:	learn: 0.1593175	total: 9m 56s	remaining: 18m 4s
360:	learn: 0.1592474	total: 10m 6s	remaining: 17m 53s
366:	learn: 0.1591832	total: 10m 15s	remaining: 17m 41s
372:	learn: 0.1591152	total: 10m 25s	remaining: 17m 31s
378:	learn: 0.1590089	total: 10m 37s	remaining: 17m 24s
384:	learn: 0.1589326	total: 11m 1s	remaining: 17m 37s
390:	learn: 0.1588517	total: 11m 20s	remaining: 17m 40s
396:	learn: 0.1587540	total: 11m 32s	remaining: 17m 31s
402:	learn: 0.1586820	total: 11m 48s	remaining: 17m 28s
408:	learn: 0.1585950	total: 11m 58s	remaining: 17m 18s
414:	learn: 0.1585257	total: 12m 12s	remaining: 17m 12s
420:	learn: 0.1584614	total: 12m 24s	remaining: 17m 3s
426:	learn: 0.1583876	total: 12m 42s	remaining: 17m 3s
432:	learn: 0.1583259	total: 12m 55s	remaining: 16m 55s
438:	learn: 0.1582506	total: 13m 22s	remaining: 17m 5s
444:	learn: 0.1581733	total: 13m 35s	remaining: 16m 57s
450:	learn: 0.1580928	total: 13m 46s	remaining: 16m 46s

456:	learn: 0.1580222	total: 13m 58s	remaining: 16m 36s
462:	learn: 0.1579484	total: 14m 9s	remaining: 16m 25s
468:	learn: 0.1578807	total: 14m 19s	remaining: 16m 13s
474:	learn: 0.1578204	total: 14m 29s	remaining: 16m 1s
480:	learn: 0.1577599	total: 14m 39s	remaining: 15m 49s
486:	learn: 0.1577183	total: 14m 50s	remaining: 15m 37s
492:	learn: 0.1576623	total: 15m	remaining: 15m 25s
498:	learn: 0.1576149	total: 15m 9s	remaining: 15m 13s
504:	learn: 0.1575605	total: 15m 19s	remaining: 15m 1s
510:	learn: 0.1575124	total: 15m 28s	remaining: 14m 48s
516:	learn: 0.1574595	total: 15m 43s	remaining: 14m 41s
522:	learn: 0.1574136	total: 15m 54s	remaining: 14m 30s
528:	learn: 0.1573712	total: 16m 4s	remaining: 14m 18s
534:	learn: 0.1573165	total: 16m 15s	remaining: 14m 7s
540:	learn: 0.1572666	total: 16m 31s	remaining: 14m 1s
546:	learn: 0.1572206	total: 16m 42s	remaining: 13m 50s
552:	learn: 0.1571743	total: 16m 54s	remaining: 13m 40s
558:	learn: 0.1571306	total: 17m 7s	remaining: 13m 30s
564:	learn: 0.1570762	total: 17m 22s	remaining: 13m 22s
570:	learn: 0.1570248	total: 17m 37s	remaining: 13m 14s
576:	learn: 0.1569764	total: 17m 53s	remaining: 13m 6s
582:	learn: 0.1569318	total: 18m 4s	remaining: 12m 56s
588:	learn: 0.1568878	total: 18m 17s	remaining: 12m 45s

594:	learn: 0.1568489	total: 18m 26s	remaining: 12m 33s
600:	learn: 0.1568090	total: 18m 37s	remaining: 12m 22s
606:	learn: 0.1567691	total: 18m 47s	remaining: 12m 10s
612:	learn: 0.1567318	total: 18m 59s	remaining: 11m 59s
618:	learn: 0.1566859	total: 19m 9s	remaining: 11m 47s
624:	learn: 0.1566401	total: 19m 21s	remaining: 11m 36s
630:	learn: 0.1565976	total: 19m 32s	remaining: 11m 25s
636:	learn: 0.1565612	total: 19m 44s	remaining: 11m 15s
642:	learn: 0.1565179	total: 19m 55s	remaining: 11m 3s
648:	learn: 0.1564854	total: 20m 6s	remaining: 10m 52s
654:	learn: 0.1564483	total: 20m 16s	remaining: 10m 40s
660:	learn: 0.1564080	total: 20m 27s	remaining: 10m 29s
666:	learn: 0.1563745	total: 20m 38s	remaining: 10m 18s
672:	learn: 0.1563400	total: 20m 48s	remaining: 10m 6s
678:	learn: 0.1562912	total: 20m 58s	remaining: 9m 55s
684:	learn: 0.1562411	total: 21m 13s	remaining: 9m 45s
690:	learn: 0.1562105	total: 21m 25s	remaining: 9m 35s
696:	learn: 0.1561825	total: 21m 39s	remaining: 9m 24s
702:	learn: 0.1561519	total: 21m 50s	remaining: 9m 13s
708:	learn: 0.1561141	total: 22m 1s	remaining: 9m 2s
714:	learn: 0.1560816	total: 22m 13s	remaining: 8m 51s
720:	learn: 0.1560541	total: 22m 24s	remaining: 8m 40s
726:	learn: 0.1560218	total: 22m 35s	remaining: 8m 28s
732:	learn: 0.1559889	total: 22m 45s	remaining: 8m 17s
738:	learn: 0.1559605	total: 22m 57s	remaining: 8m 6s
744:	learn: 0.1559234	total: 23m 11s	remaining: 7m 56s
750:	learn: 0.1558913	total: 23m 29s	remaining: 7m 47s
756:	learn: 0.1558476	total: 23m 41s	remaining: 7m 36s
762:	learn: 0.1558176	total: 23m 52s	remaining: 7m 25s
768:	learn: 0.1557832	total: 24m 5s	remaining: 7m 14s
774:	learn: 0.1557571	total: 24m 15s	remaining: 7m 2s
780:	learn: 0.1557288	total: 24m 27s	remaining: 6m 51s
786:	learn: 0.1556965	total: 24m 37s	remaining: 6m 39s
792:	learn: 0.1556628	total: 24m 57s	remaining: 6m 30s
798:	learn: 0.1556367	total: 25m 8s	remaining: 6m 19s
804:	learn: 0.1556091	total: 25m 18s	remaining: 6m 7s
810:	learn: 0.1555744	total: 25m 30s	remaining: 5m 56s
816:	learn: 0.1555483	total: 25m 41s	remaining: 5m 45s
822:	learn: 0.1555249	total: 25m 53s	remaining: 5m 34s
828:	learn: 0.1554928	total: 26m 7s	remaining: 5m 23s
834:	learn: 0.1554665	total: 26m 20s	remaining: 5m 12s
840:	learn: 0.1554363	total: 26m 33s	remaining: 5m 1s
846:	learn: 0.1554094	total: 26m 43s	remaining: 4m 49s
852:	learn: 0.1553750	total: 26m 54s	remaining: 4m 38s
858:	learn: 0.1553439	total: 27m 5s	remaining: 4m 26s
864:	learn: 0.1553161	total: 27m 26s	remaining: 4m 16s
870:	learn: 0.1552882	total: 27m 43s	remaining: 4m 6s
876:	learn: 0.1552661	total: 28m 3s	remaining: 3m 56s
882:	learn: 0.1552409	total: 28m 17s	remaining: 3m 44s
888:	learn: 0.1552152	total: 28m 35s	remaining: 3m 34s
894:	learn: 0.1551872	total: 28m 48s	remaining: 3m 22s
900:	learn: 0.1551605	total: 28m 58s	remaining: 3m 11s
906:	learn: 0.1551349	total: 29m 9s	remaining: 2m 59s
912:	learn: 0.1551087	total: 29m 21s	remaining: 2m 47s
918:	learn: 0.1550812	total: 29m 34s	remaining: 2m 36s
924:	learn: 0.1550562	total: 29m 47s	remaining: 2m 24s
930:	learn: 0.1550290	total: 29m 59s	remaining: 2m 13s
936:	learn: 0.1550059	total: 30m 12s	remaining: 2m 1s
942:	learn: 0.1549783	total: 30m 23s	remaining: 1m 50s
948:	learn: 0.1549570	total: 30m 34s	remaining: 1m 38s
954:	learn: 0.1549319	total: 30m 44s	remaining: 1m 26s

```
960:    learn: 0.1549101      total: 30m 55s  remaining: 1m 15s
966:    learn: 0.1548850      total: 31m 7s   remaining: 1m 3s
972:    learn: 0.1548535      total: 31m 22s  remaining: 52.2s
978:    learn: 0.1548253      total: 31m 38s  remaining: 40.7s
984:    learn: 0.1548021      total: 31m 51s  remaining: 29.1s
990:    learn: 0.1547720      total: 32m 5s   remaining: 17.5s
996:    learn: 0.1547454      total: 32m 16s  remaining: 5.83s
999:    learn: 0.1547334      total: 32m 22s  remaining: 0us
score: 0.9381838810516268
```

Средний скор на валидации:

In [13]:

```
1 np.mean(scores)
```

Out[13]:

```
0.9378753275122685
```

In [16]:

```
1 prediction
```

Out[16]:

```
array([-0.0239915 ,  0.02709293,  0.09398148, ..., -0.00213793,
        -0.00281308, -0.0207176  ])
```

Сохраним предсказания.

In [14]:

```
1 def pred_proc(pred):
2     pred = np.round(np.clip(pred, 0, 10))
3     return pred.astype(int)
```

In [17]:

```
1 y_catboost_pred = pred_proc(prediction)
2
3 sample_df = pd.read_csv("data/sample_submission.csv", dtype={'time':str})
4 sample_df['open_channels'] = y_catboost_pred
5 sample_df.to_csv("catboost_3_default.csv", index=False, float_format='%.4f')
```

In [19]:

```
1 np.save('preds_best_catboost', prediction)
2 np.save('oof_best_catboost', oof)
```

0.940 LB

Неплохой результат для дефолтной модели.

In []:

1	
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