blend_all

May 22, 2021

1 Read Data

[ ]:
```
PATH = './'
```

[135]:
```
import pandas as pd
import os
import optuna
train_df = pd.read_csv(f'{PATH}final_log_df_train.csv')
dev_df = pd.read_csv(f'{PATH}final_log_df_dev.csv')
train_column_rename = {}
for col in train_df.columns:
    new_column_name = col.replace('train', '')
    train_column_rename[col] = new_column_name
train_df.rename(columns=train_column_rename, inplace=True)
train_df['tag'] = train_df['tag'].map({'T': 1, 'F':0})
dev_df['tag'] = dev_df['tag'].map({'T': 1, 'F':0})
dev_column_rename = {}
for col in dev_df.columns:
    new_column_name = col.replace('dev', '')
    dev_column_rename[col] = new_column_name
dev_df.rename(columns=dev_column_rename, inplace=True)
```

[136]:
```
dev_df
```

[136]:

	xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=3+<mask>-(and-also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_ \
0	0.0
1	0.2
2	0.0
3	0.0
4	0.0
..	…
995	0.0
996	0.0
997	0.0
998	0.0

```
999                                                    0.0

     tag  \
0      0
1      1
2      0
3      0
4      1
..   …
995    1
996    0
997    0
998    1
999    0

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=8+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.066667
1                                                   0.230769
2                                                   0.000000
3                                                   0.000000
4                                                   0.066667
..                                                       …
995                                                 0.066667
996                                                 0.000000
997                                                 0.000000
998                                                 0.000000
999                                                 0.000000

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=16+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.142857
1                                                   0.391304
2                                                   0.000000
3                                                   0.000000
4                                                   0.103448
..                                                       …
995                                                 0.103448
996                                                 0.000000
997                                                 0.000000
998                                                 0.000000
999                                                 0.066667

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=32+<mask>-(and-
```

```
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.185185
1                                                  0.306122
2                                                  0.000000
3                                                  0.000000
4                                                  0.230769
..                                                      …
995                                                0.122807
996                                                0.015873
997                                                0.015873
998                                                0.015873
999                                                0.207547

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=60+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.263158
1                                                  0.379310
2                                                  0.008403
3                                                  0.000000
4                                                  0.276596
..                                                      …
995                                                0.188119
996                                                0.081081
997                                                0.132075
998                                                0.025641
999                                                0.304348

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=75+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.250000
1                                                  0.351351
2                                                  0.006711
3                                                  0.000000
4                                                  0.271186
..                                                      …
995                                                0.181102
996                                                0.094891
997                                                0.145038
998                                                0.034483
999                                                0.339286

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=100+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.234568
```

```
1                                                   0.315789
2                                                   0.036269
3                                                   0.025641
4                                                   0.265823
..                                                       …
995                                                 0.197605
996                                                 0.104972
997                                                 0.149425
998                                                 0.036269
999                                                 0.398601

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=115+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.229947
1                                                   0.299435
2                                                   0.031390
3                                                   0.040724
4                                                   0.299435
..                                                       …
995                                                 0.204188
996                                                 0.121951
997                                                 0.167513
998                                                 0.045455
999                                                 0.419753

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=130+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.244019
1                                                   0.333333
2                                                   0.031746
3                                                   0.044177
4                                                   0.306533
..                                                       …
995                                                 0.198157
996                                                 0.155556
997                                                 0.171171
998                                                 0.052632
999                                                 0.460674

     …  \
0    …
1    …
2    …
3    …
4    …
```

..	…
995	…
996	…
997	…
998	…
999	…

	xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=16+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \
0	0.066667
1	0.103448
2	0.032258
3	0.000000
4	0.066667
..	…
995	0.185185
996	0.000000
997	0.032258
998	0.032258
999	0.000000

	xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=32+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \
0	0.066667
1	0.066667
2	0.015873
3	0.015873
4	0.122807
..	…
995	0.207547
996	0.000000
997	0.015873
998	0.066667
999	0.015873

	xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=60+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \
0	0.052632
1	0.061947
2	0.043478
3	0.034483
4	0.176471
..	…
995	0.153846
996	0.025641
997	0.034483
998	0.072072

```
999                                                 0.062500

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=75+T-or-<m
ask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                   0.056338
1                                                   0.102941
2                                                   0.056338
3                                                   0.034483
4                                                   0.181102
..                                                       …
995                                                 0.145038
996                                                 0.034722
997                                                 0.034483
998                                                 0.079710
999                                                 0.064286

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=100+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                   0.047120
1                                                   0.123596
2                                                   0.092896
3                                                   0.063830
4                                                   0.149425
..                                                       …
995                                                 0.169591
996                                                 0.025773
997                                                 0.031088
998                                                 0.064516
999                                                 0.076087

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=115+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                   0.045455
1                                                   0.116505
2                                                   0.090047
3                                                   0.069767
4                                                   0.138614
..                                                       …
995                                                 0.167513
996                                                 0.026906
997                                                 0.031532
998                                                 0.060465
999                                                 0.096154

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=130+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                   0.052632
```

1	0.111111
2	0.101695
3	0.061224
4	0.130435
..	…
995	0.176471
996	0.031873
997	0.031873
998	0.061728
999	0.088983

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=150+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \

0	0.060071
1	0.111111
2	0.098901
3	0.067616
4	0.132075
..	…
995	0.162791
996	0.027491
997	0.027491
998	0.068100
999	0.100000

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=175+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \

0	0.067073
1	0.104101
2	0.090343
3	0.057402
4	0.155116
..	…
995	0.178451
996	0.026471
997	0.029499
998	0.070769
999	0.091195

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=240+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_

0	0.071429
1	0.116279
2	0.098398
3	0.073826
4	0.156627
..	…

```
995                                                 0.203008
996                                                 0.036797
997                                                 0.036876
998                                                 0.086364
999                                                 0.101617

[1000 rows x 577 columns]
```

[137]:
```
y_train = train_df.tag
train_df.drop(columns='tag', inplace=True)

y_dev = dev_df.tag
dev_df.drop(columns='tag', inplace=True)
```

[138]:
```
dev_df
```

[138]:
```
     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=3+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.0
1                                                   0.2
2                                                   0.0
3                                                   0.0
4                                                   0.0
..                                                  …
995                                                 0.0
996                                                 0.0
997                                                 0.0
998                                                 0.0
999                                                 0.0

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=8+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.066667
1                                                   0.230769
2                                                   0.000000
3                                                   0.000000
4                                                   0.066667
..                                                       …
995                                                 0.066667
996                                                 0.000000
997                                                 0.000000
998                                                 0.000000
999                                                 0.000000

     xlmr-
```

```
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=16+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.142857
1                                                  0.391304
2                                                  0.000000
3                                                  0.000000
4                                                  0.103448
..                                                      …
995                                                0.103448
996                                                0.000000
997                                                0.000000
998                                                0.000000
999                                                0.066667

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=32+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.185185
1                                                  0.306122
2                                                  0.000000
3                                                  0.000000
4                                                  0.230769
..                                                      …
995                                                0.122807
996                                                0.015873
997                                                0.015873
998                                                0.015873
999                                                0.207547

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=60+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                  0.263158
1                                                  0.379310
2                                                  0.008403
3                                                  0.000000
4                                                  0.276596
..                                                      …
995                                                0.188119
996                                                0.081081
997                                                0.132075
998                                                0.025641
999                                                0.304348

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=75+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
```

```
0                                                   0.250000
1                                                   0.351351
2                                                   0.006711
3                                                   0.000000
4                                                   0.271186
..                                                       …
995                                                 0.181102
996                                                 0.094891
997                                                 0.145038
998                                                 0.034483
999                                                 0.339286

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=100+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.234568
1                                                   0.315789
2                                                   0.036269
3                                                   0.025641
4                                                   0.265823
..                                                       …
995                                                 0.197605
996                                                 0.104972
997                                                 0.149425
998                                                 0.036269
999                                                 0.398601

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=115+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.229947
1                                                   0.299435
2                                                   0.031390
3                                                   0.040724
4                                                   0.299435
..                                                       …
995                                                 0.204188
996                                                 0.121951
997                                                 0.167513
998                                                 0.045455
999                                                 0.419753

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=130+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                   0.244019
1                                                   0.333333
```

```
2                                                    0.031746
3                                                    0.044177
4                                                    0.306533
..                                                        …
995                                                  0.198157
996                                                  0.155556
997                                                  0.171171
998                                                  0.052632
999                                                  0.460674

     xlmr-
baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=150+<mask>-(and-
also-T)-2ltr1f_topk500_fixspacesTruelemmIoUforLog+0.0++0.0+_  \
0                                                    0.244813
1                                                    0.315789
2                                                    0.038062
3                                                    0.052632
4                                                    0.321586
..                                                        …
995                                                  0.204819
996                                                  0.162791
997                                                  0.195219
998                                                  0.056338
999                                                  0.485149

     …  \
0    …
1    …
2    …
3    …
4    …
..   …
995  …
996  …
997  …
998  …
999  …

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=16+T-or-<m
ask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                    0.066667
1                                                    0.103448
2                                                    0.032258
3                                                    0.000000
4                                                    0.066667
..                                                        …
995                                                  0.185185
```

996	0.000000
997	0.032258
998	0.032258
999	0.000000

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=32+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \

0	0.066667
1	0.066667
2	0.015873
3	0.015873
4	0.122807
..	…
995	0.207547
996	0.000000
997	0.015873
998	0.066667
999	0.015873

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=60+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \

0	0.052632
1	0.061947
2	0.043478
3	0.034483
4	0.176471
..	…
995	0.153846
996	0.025641
997	0.034483
998	0.072072
999	0.062500

xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=75+T-or-<mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_ \

0	0.056338
1	0.102941
2	0.056338
3	0.034483
4	0.181102
..	…
995	0.145038
996	0.034722
997	0.034483
998	0.079710
999	0.064286

```
     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=100+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                  0.047120
1                                                  0.123596
2                                                  0.092896
3                                                  0.063830
4                                                  0.149425
..                                                      …
995                                                0.169591
996                                                0.025773
997                                                0.031088
998                                                0.064516
999                                                0.076087

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=115+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                  0.045455
1                                                  0.116505
2                                                  0.090047
3                                                  0.069767
4                                                  0.138614
..                                                      …
995                                                0.167513
996                                                0.026906
997                                                0.031532
998                                                0.060465
999                                                0.096154

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=130+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                  0.052632
1                                                  0.111111
2                                                  0.101695
3                                                  0.061224
4                                                  0.130435
..                                                      …
995                                                0.176471
996                                                0.031873
997                                                0.031873
998                                                0.061728
999                                                0.088983

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=150+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                  0.060071
1                                                  0.111111
2                                                  0.098901
```

```
3                                                    0.067616
4                                                    0.132075
..                                                        …
995                                                  0.162791
996                                                  0.027491
997                                                  0.027491
998                                                  0.068100
999                                                  0.100000

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=175+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_  \
0                                                    0.067073
1                                                    0.104101
2                                                    0.090343
3                                                    0.057402
4                                                    0.155116
..                                                        …
995                                                  0.178451
996                                                  0.026471
997                                                  0.029499
998                                                  0.070769
999                                                  0.091195

     xlmr-baseline.metric=IoU.post_process=post_process_lemm.kmasks_1=240+T-or-<
mask><mask><mask>-2ltr3f_topk500_fixspacesTruelemmIoUforLog+0.0+_
0                                                    0.071429
1                                                    0.116279
2                                                    0.098398
3                                                    0.073826
4                                                    0.156627
..                                                        …
995                                                  0.203008
996                                                  0.036797
997                                                  0.036876
998                                                  0.086364
999                                                  0.101617

[1000 rows x 576 columns]
```

2 Inference

[139]:
```
from sklearn.metrics import accuracy_score, log_loss
from sklearn.model_selection import StratifiedKFold
import lightgbm as lgb
import numpy as np
```

```
def fit_predict(n_splits, params, x_train, y_train, x_test):

    oof = np.zeros(x_train.shape[0])

    y_preds = []

    cv = StratifiedKFold(n_splits=n_splits, shuffle=True, random_state=42)
    for train_idx, valid_idx in cv.split(x_train, y_train):

        x_train_train = train_df.iloc[train_idx]
        y_train_train = y_train.iloc[train_idx]
        x_train_valid = train_df.iloc[valid_idx]
        y_train_valid = y_train.iloc[valid_idx]

        lgb_train = lgb.Dataset(data=x_train_train.astype('float32'),␣
↪label=y_train_train.astype('float32'))
        lgb_valid = lgb.Dataset(data=x_train_valid.astype('float32'),␣
↪label=y_train_valid.astype('float32'))

        estimator = lgb.train(params, lgb_train, 10000, valid_sets=lgb_valid,
                              early_stopping_rounds=25, verbose_eval=0)

        oof_part = estimator.predict(x_train_valid, num_iteration=estimator.
↪best_iteration)
        oof[valid_idx] = oof_part

        if x_test is not None:
            y_part = estimator.predict(x_test, num_iteration=estimator.
↪best_iteration)
            y_preds.append(y_part)

    score = log_loss(y_train, oof)
    print('LogLoss Score:', score)

    y_pred = np.mean(y_preds, axis=0)

    return y_pred, oof, score
```

[145]:
```
score_list = []
all_params = []
```

[146]:
```
def objective(trial):

    params = {
        'objective': 'binary',
        'metric': 'binary_logloss',
        'boosting_type': 'gbdt',
```

```
        'boost_from_average': True,
        'num_threads': 4,
        'random_state': 42,

        'num_leaves': trial.suggest_int('num_leaves', 10, 1000),
        'min_data_in_leaf': trial.suggest_int('min_data_in_leaf', 10, 200),
        'min_child_weight': trial.suggest_loguniform('min_child_weight', 0.001,␣
↪0.1),
        'max_depth': trial.suggest_int('max_depth', 1, 100),
        'bagging_fraction': trial.suggest_loguniform('bagging_fraction', .5, .
↪99),
        'feature_fraction': trial.suggest_loguniform('feature_fraction', .5, .
↪99),
        'lambda_l1': trial.suggest_loguniform('lambda_l1', 0.1, 2),
        'lambda_l2': trial.suggest_loguniform('lambda_l2', 0.1, 2)
    }

    scores = []
    _, _, score = fit_predict(5, params, train_df, y_train, None)
    scores.append(score)
    score_list.append(np.mean(scores))
    all_params.append(params)
    return np.mean(scores)
```

[ ]:
```
study = optuna.create_study(direction='minimize')
study.optimize(objective, n_trials=100)
```

```
[I 2021-05-22 07:18:44,236] A new study created in memory with name:
no-name-35277479-f16e-4a26-b8df-893b731df57a
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:18:55,312] Trial 0 finished with value:
0.42499544218305074 and parameters: {'num_leaves': 863, 'min_data_in_leaf': 47,
'min_child_weight': 0.008948562794658634, 'max_depth': 21, 'bagging_fraction':
0.5100433783698829, 'feature_fraction': 0.6733304408729441, 'lambda_l1':
0.7849678148717756, 'lambda_l2': 0.5625608497268687}. Best is trial 0 with
value: 0.42499544218305074.

LogLoss Score: 0.42499544218305074
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:01,858] Trial 1 finished with value:
0.4209158229260208 and parameters: {'num_leaves': 236, 'min_data_in_leaf': 142,
'min_child_weight': 0.03043705788970173, 'max_depth': 73, 'bagging_fraction':
0.5298156612635471, 'feature_fraction': 0.5609156720518224, 'lambda_l1':
1.7681407832093323, 'lambda_l2': 0.2031382304472772}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4209158229260208

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:09,630] Trial 2 finished with value:
0.4230356916895638 and parameters: {'num_leaves': 444, 'min_data_in_leaf': 158,
'min_child_weight': 0.016431597317006285, 'max_depth': 74, 'bagging_fraction':
0.6643916594134726, 'feature_fraction': 0.7171898782228667, 'lambda_l1':
0.8306848600431477, 'lambda_l2': 1.3030477966732323}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4230356916895638

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:19,149] Trial 3 finished with value:
0.4261994418276989 and parameters: {'num_leaves': 640, 'min_data_in_leaf': 47,
```

```
'min_child_weight': 0.02994867056330888, 'max_depth': 40, 'bagging_fraction':
0.5069532874328315, 'feature_fraction': 0.5257376448343911, 'lambda_l1':
0.18634169013694696, 'lambda_l2': 0.14618578366724466}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4261994418276989

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:28,902] Trial 4 finished with value:
0.4235887836649772 and parameters: {'num_leaves': 391, 'min_data_in_leaf': 177,
'min_child_weight': 0.029975658675127363, 'max_depth': 8, 'bagging_fraction':
0.5031416846246834, 'feature_fraction': 0.5881798971842789, 'lambda_l1':
0.40396948603612015, 'lambda_l2': 1.5260045548228502}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4235887836649772

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:40,437] Trial 5 finished with value:
0.42451990866552064 and parameters: {'num_leaves': 277, 'min_data_in_leaf': 95,
'min_child_weight': 0.010844147133278161, 'max_depth': 7, 'bagging_fraction':
0.8615920775812875, 'feature_fraction': 0.8898669181270564, 'lambda_l1':
0.33305746437984285, 'lambda_l2': 1.4489249168255962}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.42451990866552064

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:19:50,097] Trial 6 finished with value:
0.42366469407175944 and parameters: {'num_leaves': 286, 'min_data_in_leaf': 145,
'min_child_weight': 0.002448533657078585, 'max_depth': 44, 'bagging_fraction':
0.5091160470849322, 'feature_fraction': 0.6393075396868914, 'lambda_l1':
0.3301607124707287, 'lambda_l2': 0.3305527494132835}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.42366469407175944

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:02,416] Trial 7 finished with value:
0.4240022226936362 and parameters: {'num_leaves': 970, 'min_data_in_leaf': 155,
'min_child_weight': 0.007952015424151464, 'max_depth': 70, 'bagging_fraction':
0.5172765734274577, 'feature_fraction': 0.7803771105810978, 'lambda_l1':
0.11930891231790196, 'lambda_l2': 0.7612613642535049}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4240022226936362

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:14,844] Trial 8 finished with value:
0.4227936695993409 and parameters: {'num_leaves': 106, 'min_data_in_leaf': 184,
'min_child_weight': 0.018277941269218716, 'max_depth': 86, 'bagging_fraction':
0.5696622246514174, 'feature_fraction': 0.8844891344448985, 'lambda_l1':
0.6200806963992552, 'lambda_l2': 0.5384595558636758}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4227936695993409
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:28,963] Trial 9 finished with value:
0.42358027794652375 and parameters: {'num_leaves': 612, 'min_data_in_leaf': 174,
'min_child_weight': 0.017036783530963297, 'max_depth': 13, 'bagging_fraction':
0.9382292503883178, 'feature_fraction': 0.8353616703874946, 'lambda_l1':
1.137616412268302, 'lambda_l2': 0.8331018034830373}. Best is trial 1 with value:
0.4209158229260208.

LogLoss Score: 0.42358027794652375

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:37,427] Trial 10 finished with value:
0.42346381606388356 and parameters: {'num_leaves': 22, 'min_data_in_leaf': 13,
'min_child_weight': 0.057449866607371565, 'max_depth': 98, 'bagging_fraction':
0.646599601007708, 'feature_fraction': 0.5021435918364667, 'lambda_l1':
1.9304599679653485, 'lambda_l2': 0.10380467884491724}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.42346381606388356

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:46,608] Trial 11 finished with value:
0.4256842849308546 and parameters: {'num_leaves': 24, 'min_data_in_leaf': 115,
```

'min_child_weight': 0.09512257007111073, 'max_depth': 100, 'bagging_fraction': 0.593668848585297, 'feature_fraction': 0.9845372911226484, 'lambda_l1': 1.8723431046104213, 'lambda_l2': 0.2582638000390972}. Best is trial 1 with value: 0.4209158229260208.

LogLoss Score: 0.4256842849308546

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161: RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:20:54,190] Trial 12 finished with value: 0.4235692099744065 and parameters: {'num_leaves': 153, 'min_data_in_leaf': 200, 'min_child_weight': 0.0033412955476418557, 'max_depth': 78, 'bagging_fraction': 0.5895215160196452, 'feature_fraction': 0.5748457243735362, 'lambda_l1': 1.2142418572504992, 'lambda_l2': 0.21255371845368387}. Best is trial 1 with value: 0.4209158229260208.

LogLoss Score: 0.4235692099744065

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161: RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:21:10,596] Trial 13 finished with value: 0.4238330997787257 and parameters: {'num_leaves': 141, 'min_data_in_leaf': 120, 'min_child_weight': 0.0458225270248677, 'max_depth': 87, 'bagging_fraction': 0.7890237293422839, 'feature_fraction': 0.9804371607547785, 'lambda_l1': 0.6847417504745524, 'lambda_l2': 0.42900952099353323}. Best is trial 1 with value: 0.4209158229260208.

LogLoss Score: 0.4238330997787257

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:21:23,524] Trial 14 finished with value:
0.42389732489280685 and parameters: {'num_leaves': 169, 'min_data_in_leaf': 189,
'min_child_weight': 0.005434588942814008, 'max_depth': 58, 'bagging_fraction':
0.573403278005758, 'feature_fraction': 0.7304897469344852, 'lambda_l1':
0.21210853019895648, 'lambda_l2': 0.16349349952359718}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.42389732489280685

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:21:34,560] Trial 15 finished with value:
0.42574632347445607 and parameters: {'num_leaves': 19, 'min_data_in_leaf': 132,
'min_child_weight': 0.001113827241552057, 'max_depth': 90, 'bagging_fraction':
0.7386535173703773, 'feature_fraction': 0.8860133151445667, 'lambda_l1':
0.5855976940027419, 'lambda_l2': 0.38991637466856105}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.42574632347445607

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:21:46,048] Trial 16 finished with value:
0.42276780041585627 and parameters: {'num_leaves': 271, 'min_data_in_leaf': 87,
'min_child_weight': 0.022313156161331147, 'max_depth': 61, 'bagging_fraction':
0.5541856367817759, 'feature_fraction': 0.602265838846101, 'lambda_l1':
1.3704910798713128, 'lambda_l2': 0.666315475070153}. Best is trial 1 with value:
0.4209158229260208.

LogLoss Score: 0.42276780041585627
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:21:59,535] Trial 17 finished with value:
0.4235409217745889 and parameters: {'num_leaves': 314, 'min_data_in_leaf': 88,
'min_child_weight': 0.05806726540582153, 'max_depth': 58, 'bagging_fraction':
0.5483587931244099, 'feature_fraction': 0.5573342772997825, 'lambda_l1':
1.4308171993301315, 'lambda_l2': 0.962853627279086}. Best is trial 1 with value:
0.4209158229260208.

LogLoss Score: 0.4235409217745889

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:22:11,607] Trial 18 finished with value:
0.4226167762556053 and parameters: {'num_leaves': 543, 'min_data_in_leaf': 71,
'min_child_weight': 0.09699387226807958, 'max_depth': 31, 'bagging_fraction':
0.6342307785858183, 'feature_fraction': 0.6256667054469864, 'lambda_l1':
1.9921440637922339, 'lambda_l2': 0.11792368555698898}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4226167762556053

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:22:25,736] Trial 19 finished with value:
0.4255959946591081 and parameters: {'num_leaves': 589, 'min_data_in_leaf': 54,
```

```
'min_child_weight': 0.09929630793788891, 'max_depth': 32, 'bagging_fraction':
0.6264643812055308, 'feature_fraction': 0.6414935748724688, 'lambda_l1':
1.8116992276744592, 'lambda_l2': 0.10608357616332013}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4255959946591081

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:22:46,062] Trial 20 finished with value:
0.4292490698494446 and parameters: {'num_leaves': 788, 'min_data_in_leaf': 19,
'min_child_weight': 0.09403241446794866, 'max_depth': 31, 'bagging_fraction':
0.7151812669704463, 'feature_fraction': 0.5421915031804665, 'lambda_l1':
0.9924567755420843, 'lambda_l2': 0.13410165179387418}. Best is trial 1 with
value: 0.4209158229260208.

LogLoss Score: 0.4292490698494446

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:23:01,090] Trial 21 finished with value:
0.4206535492796133 and parameters: {'num_leaves': 485, 'min_data_in_leaf': 78,
'min_child_weight': 0.03626384102195481, 'max_depth': 65, 'bagging_fraction':
0.537848512807816, 'feature_fraction': 0.6146584600016997, 'lambda_l1':
1.4907981933869046, 'lambda_l2': 0.26088247694493494}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4206535492796133

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:23:20,768] Trial 22 finished with value:
0.42350641787993193 and parameters: {'num_leaves': 511, 'min_data_in_leaf': 57,
'min_child_weight': 0.04203481579233152, 'max_depth': 49, 'bagging_fraction':
0.6268907726207454, 'feature_fraction': 0.621075537080508, 'lambda_l1':
1.9453951546026034, 'lambda_l2': 0.2264933740742557}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42350641787993193

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:23:37,323] Trial 23 finished with value:
0.4225039394347819 and parameters: {'num_leaves': 722, 'min_data_in_leaf': 72,
'min_child_weight': 0.07215686354198478, 'max_depth': 66, 'bagging_fraction':
0.5474711069786796, 'feature_fraction': 0.6675375267506439, 'lambda_l1':
1.544126936875265, 'lambda_l2': 0.2815358497245394}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225039394347819

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:23:51,070] Trial 24 finished with value:
0.42370058184368586 and parameters: {'num_leaves': 723, 'min_data_in_leaf': 71,
'min_child_weight': 0.0701340442327914, 'max_depth': 66, 'bagging_fraction':
0.5509513023328753, 'feature_fraction': 0.6811460003163271, 'lambda_l1':
1.529257973998068, 'lambda_l2': 0.30887423912675027}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42370058184368586
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:23:59,208] Trial 25 finished with value:
0.4236500584740847 and parameters: {'num_leaves': 711, 'min_data_in_leaf': 105,
'min_child_weight': 0.031216640329839895, 'max_depth': 78, 'bagging_fraction':
0.5345912215200321, 'feature_fraction': 0.5101103148810122, 'lambda_l1':
1.0498769580168008, 'lambda_l2': 0.27966129648267357}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4236500584740847

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:24:13,036] Trial 26 finished with value:
0.4280043931564625 and parameters: {'num_leaves': 429, 'min_data_in_leaf': 27,
'min_child_weight': 0.03830177508298064, 'max_depth': 54, 'bagging_fraction':
0.531386625920511, 'feature_fraction': 0.6758345601799319, 'lambda_l1':
1.5192016280614211, 'lambda_l2': 0.19866465166611613}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4280043931564625

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:24:30,286] Trial 27 finished with value:
0.42249480802604955 and parameters: {'num_leaves': 982, 'min_data_in_leaf': 72,
```

```
'min_child_weight': 0.06431813540503502, 'max_depth': 65, 'bagging_fraction':
0.6091980770236664, 'feature_fraction': 0.7562118236810865, 'lambda_l1':
0.8561235172380867, 'lambda_l2': 0.18475580045667675}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42249480802604955

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:24:46,519] Trial 28 finished with value:
0.42908759037255567 and parameters: {'num_leaves': 853, 'min_data_in_leaf': 33,
'min_child_weight': 0.012758903645615011, 'max_depth': 80, 'bagging_fraction':
0.5995789858677044, 'feature_fraction': 0.7669109669417296, 'lambda_l1':
0.8720029965838082, 'lambda_l2': 0.1688465262766492}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42908759037255567

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:25:00,711] Trial 29 finished with value:
0.4244523842484003 and parameters: {'num_leaves': 946, 'min_data_in_leaf': 133,
'min_child_weight': 0.02424709261134856, 'max_depth': 65, 'bagging_fraction':
0.6869231841062666, 'feature_fraction': 0.7479628718038704, 'lambda_l1':
0.7579033114566276, 'lambda_l2': 0.18893842410666278}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4244523842484003

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:25:24,082] Trial 30 finished with value:
0.42281524284228705 and parameters: {'num_leaves': 335, 'min_data_in_leaf': 105,
'min_child_weight': 0.0567680684883194, 'max_depth': 51, 'bagging_fraction':
0.6082233322663275, 'feature_fraction': 0.8026424174353508, 'lambda_l1':
0.4760485019346207, 'lambda_l2': 0.3645295405247786}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42281524284228705

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:25:50,110] Trial 31 finished with value:
0.4247789632885165 and parameters: {'num_leaves': 892, 'min_data_in_leaf': 74,
'min_child_weight': 0.07381890418849403, 'max_depth': 68, 'bagging_fraction':
0.5329237166189311, 'feature_fraction': 0.6976931374180838, 'lambda_l1':
1.2506212128583833, 'lambda_l2': 0.22441353225371954}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4247789632885165

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:26:13,311] Trial 32 finished with value:
0.4240366277912888 and parameters: {'num_leaves': 725, 'min_data_in_leaf': 61,
'min_child_weight': 0.04080835054955021, 'max_depth': 74, 'bagging_fraction':
0.5700973917225364, 'feature_fraction': 0.6512013581331562, 'lambda_l1':
0.9227951012371449, 'lambda_l2': 0.45776923562249905}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4240366277912888
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:26:33,157] Trial 33 finished with value:
0.4225723682258615 and parameters: {'num_leaves': 471, 'min_data_in_leaf': 80,
'min_child_weight': 0.07414052996587195, 'max_depth': 72, 'bagging_fraction':
0.5207168257680452, 'feature_fraction': 0.7038921012232252, 'lambda_l1':
1.5921805697596456, 'lambda_l2': 0.26117278785527936}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225723682258615

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:26:55,405] Trial 34 finished with value:
0.4262083581904463 and parameters: {'num_leaves': 675, 'min_data_in_leaf': 39,
'min_child_weight': 0.02674753182520938, 'max_depth': 62, 'bagging_fraction':
0.6698748107774499, 'feature_fraction': 0.5801512505870657, 'lambda_l1':
1.638230475771457, 'lambda_l2': 1.9696491896105475}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4262083581904463

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:27:05,571] Trial 35 finished with value:
0.42152961348790596 and parameters: {'num_leaves': 822, 'min_data_in_leaf': 91,
```

```
'min_child_weight': 0.035439141061624845, 'max_depth': 82, 'bagging_fraction':
0.5011053309662185, 'feature_fraction': 0.6056096990664759, 'lambda_l1':
1.1844720517159524, 'lambda_l2': 0.14658226907987712}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42152961348790596

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:27:15,003] Trial 36 finished with value:
0.42550154423833275 and parameters: {'num_leaves': 845, 'min_data_in_leaf': 99,
'min_child_weight': 0.01344076973028011, 'max_depth': 95, 'bagging_fraction':
0.5107246111073451, 'feature_fraction': 0.5491645036128608, 'lambda_l1':
0.7735558334858119, 'lambda_l2': 0.13819725356448473}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42550154423833275

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:27:24,797] Trial 37 finished with value:
0.4228146412482474 and parameters: {'num_leaves': 933, 'min_data_in_leaf': 120,
'min_child_weight': 0.03380694415171692, 'max_depth': 82, 'bagging_fraction':
0.5060755239818129, 'feature_fraction': 0.6132817357280784, 'lambda_l1':
1.1195579442280719, 'lambda_l2': 0.16427951056676574}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4228146412482474

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:27:35,502] Trial 38 finished with value:
0.42195383710179046 and parameters: {'num_leaves': 375, 'min_data_in_leaf': 46,
'min_child_weight': 0.021907019138733556, 'max_depth': 92, 'bagging_fraction':
0.5723736603404812, 'feature_fraction': 0.5256411996796766, 'lambda_l1':
0.9622874405636641, 'lambda_l2': 0.13868207155536094}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42195383710179046

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:27:48,929] Trial 39 finished with value:
0.4228295754169526 and parameters: {'num_leaves': 375, 'min_data_in_leaf': 158,
'min_child_weight': 0.020952567598207888, 'max_depth': 93, 'bagging_fraction':
0.5057714595133087, 'feature_fraction': 0.5249679855647258, 'lambda_l1':
0.5166683438780719, 'lambda_l2': 0.1225050225974049}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4228295754169526

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:28:19,269] Trial 40 finished with value:
0.4232269878420293 and parameters: {'num_leaves': 216, 'min_data_in_leaf': 42,
'min_child_weight': 0.015676513828539965, 'max_depth': 84, 'bagging_fraction':
0.5692156895304339, 'feature_fraction': 0.5262756507173637, 'lambda_l1':
1.282618389159453, 'lambda_l2': 0.1436325222734686}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4232269878420293
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:28:47,895] Trial 41 finished with value:
0.4264038639309304 and parameters: {'num_leaves': 995, 'min_data_in_leaf': 61,
'min_child_weight': 0.049639130866698564, 'max_depth': 77, 'bagging_fraction':
0.50046331612406, 'feature_fraction': 0.5675464190321245, 'lambda_l1':
0.9297863233689815, 'lambda_l2': 0.17554953931535586}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4264038639309304

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:29:00,833] Trial 42 finished with value:
0.42407437805491394 and parameters: {'num_leaves': 419, 'min_data_in_leaf': 95,
'min_child_weight': 0.030893502145264384, 'max_depth': 72, 'bagging_fraction':
0.5764630992359335, 'feature_fraction': 0.5310158844095668, 'lambda_l1':
0.3577502265301151, 'lambda_l2': 0.2432410076752536}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42407437805491394

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:29:13,929] Trial 43 finished with value:
0.4254077655370118 and parameters: {'num_leaves': 241, 'min_data_in_leaf': 47,
```

```
'min_child_weight': 0.008292601558248227, 'max_depth': 88, 'bagging_fraction':
0.610661840265962, 'feature_fraction': 0.5931125972259665, 'lambda_l1':
1.083478803178967, 'lambda_l2': 0.11679522871405018}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4254077655370118

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:29:25,252] Trial 44 finished with value:
0.42303098831916486 and parameters: {'num_leaves': 384, 'min_data_in_leaf': 81,
'min_child_weight': 0.019391454141061516, 'max_depth': 75, 'bagging_fraction':
0.5288817225210081, 'feature_fraction': 0.5035706785634232, 'lambda_l1':
0.6888075314481441, 'lambda_l2': 0.15165478364422375}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42303098831916486

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:29:36,879] Trial 45 finished with value:
0.4242090799714306 and parameters: {'num_leaves': 480, 'min_data_in_leaf': 90,
'min_child_weight': 0.026957869338397836, 'max_depth': 82, 'bagging_fraction':
0.5590453372350759, 'feature_fraction': 0.5689628126171671, 'lambda_l1':
1.2755408910126789, 'lambda_l2': 0.1938009007367501}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4242090799714306

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:29:49,652] Trial 46 finished with value:
0.4247593715974123 and parameters: {'num_leaves': 353, 'min_data_in_leaf': 143,
'min_child_weight': 0.03678452537733099, 'max_depth': 91, 'bagging_fraction':
0.5834227682002472, 'feature_fraction': 0.812426587829663, 'lambda_l1':
0.2653210090576965, 'lambda_l2': 0.10173437839852008}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4247593715974123

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:30:00,997] Trial 47 finished with value:
0.42194271217919854 and parameters: {'num_leaves': 67, 'min_data_in_leaf': 114,
'min_child_weight': 0.006387959706705827, 'max_depth': 100, 'bagging_fraction':
0.5207429908580179, 'feature_fraction': 0.5956007493341771, 'lambda_l1':
0.800094472917242, 'lambda_l2': 0.3125037195917875}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42194271217919854

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:30:11,447] Trial 48 finished with value:
0.42343739140104264 and parameters: {'num_leaves': 109, 'min_data_in_leaf': 112,
'min_child_weight': 0.006685836437675691, 'max_depth': 98, 'bagging_fraction':
0.5006404466503127, 'feature_fraction': 0.5972103840060596, 'lambda_l1':
1.7553467170134818, 'lambda_l2': 0.3871634196686144}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42343739140104264
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:30:28,767] Trial 49 finished with value:
0.4229383312395095 and parameters: {'num_leaves': 562, 'min_data_in_leaf': 130,
'min_child_weight': 0.0038589452742257787, 'max_depth': 100, 'bagging_fraction':
0.9466060419946888, 'feature_fraction': 0.5572506240859788, 'lambda_l1':
0.11768298935456242, 'lambda_l2': 0.31557794110872694}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4229383312395095

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:30:38,655] Trial 50 finished with value:
0.4233316454565914 and parameters: {'num_leaves': 67, 'min_data_in_leaf': 165,
'min_child_weight': 0.010591465723346231, 'max_depth': 94, 'bagging_fraction':
0.5197077888807901, 'feature_fraction': 0.5858038700380691, 'lambda_l1':
0.5863908901237512, 'lambda_l2': 0.4894085726457085}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4233316454565914

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:30:58,890] Trial 51 finished with value:
0.42411546455658067 and parameters: {'num_leaves': 211, 'min_data_in_leaf': 143,
```

```
'min_child_weight': 0.0052715232095052545, 'max_depth': 87, 'bagging_fraction':
0.5422950509475123, 'feature_fraction': 0.609868066160286, 'lambda_l1':
0.8480052671129051, 'lambda_l2': 0.2227746368360387}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42411546455658067

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:31:13,688] Trial 52 finished with value:
0.42408270942223064 and parameters: {'num_leaves': 294, 'min_data_in_leaf': 80,
'min_child_weight': 0.015004988427434765, 'max_depth': 58, 'bagging_fraction':
0.5605562245022516, 'feature_fraction': 0.6465661458584684, 'lambda_l1':
0.7102772973778401, 'lambda_l2': 0.18135493648544}. Best is trial 21 with value:
0.4206535492796133.

LogLoss Score: 0.42408270942223064

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:31:23,810] Trial 53 finished with value:
0.42598178068598896 and parameters: {'num_leaves': 636, 'min_data_in_leaf': 64,
'min_child_weight': 0.04910083179518468, 'max_depth': 70, 'bagging_fraction':
0.5236189922891389, 'feature_fraction': 0.5406349844722423, 'lambda_l1':
1.0314663810221663, 'lambda_l2': 0.33553158358345886}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42598178068598896

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:31:35,274] Trial 54 finished with value:
0.4265204809090962 and parameters: {'num_leaves': 78, 'min_data_in_leaf': 96,
'min_child_weight': 0.0022306037091128733, 'max_depth': 84, 'bagging_fraction':
0.6544444532863846, 'feature_fraction': 0.7319622218856168, 'lambda_l1':
0.8382040600202638, 'lambda_l2': 0.24658194750452697}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4265204809090962

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:31:46,876] Trial 55 finished with value:
0.42568053403088063 and parameters: {'num_leaves': 505, 'min_data_in_leaf': 51,
'min_child_weight': 0.05791792805415437, 'max_depth': 62, 'bagging_fraction':
0.5885859781368927, 'feature_fraction': 0.5168588218673736, 'lambda_l1':
1.3970250849292183, 'lambda_l2': 0.15402219344899754}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42568053403088063

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:31:59,487] Trial 56 finished with value:
0.42303180330479906 and parameters: {'num_leaves': 455, 'min_data_in_leaf': 113,
'min_child_weight': 0.02581851044013441, 'max_depth': 46, 'bagging_fraction':
0.7927540354144359, 'feature_fraction': 0.6361050607768186, 'lambda_l1':
0.10071947880206515, 'lambda_l2': 0.13123688561004007}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42303180330479906
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:32:13,034] Trial 57 finished with value:
0.42351907993532373 and parameters: {'num_leaves': 799, 'min_data_in_leaf': 126,
'min_child_weight': 0.017493618074336362, 'max_depth': 55, 'bagging_fraction':
0.5413787618497404, 'feature_fraction': 0.8628978782572015, 'lambda_l1':
1.200108862852692, 'lambda_l2': 0.2103135278555751}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42351907993532373

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:32:29,393] Trial 58 finished with value:
0.42438819744898965 and parameters: {'num_leaves': 180, 'min_data_in_leaf': 65,
'min_child_weight': 0.04675108189024398, 'max_depth': 97, 'bagging_fraction':
0.5134313427966742, 'feature_fraction': 0.9407241302098519, 'lambda_l1':
0.5277409797207131, 'lambda_l2': 0.2853618696065277}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42438819744898965

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:32:40,010] Trial 59 finished with value:
0.42095592909253343 and parameters: {'num_leaves': 254, 'min_data_in_leaf': 86,
```

```
'min_child_weight': 0.006031634826152341, 'max_depth': 41, 'bagging_fraction':
0.5631517745430297, 'feature_fraction': 0.5550869322688586, 'lambda_l1':
0.6440696435819983, 'lambda_l2': 0.20495392913369023}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42095592909253343

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:32:50,882] Trial 60 finished with value:
0.4234562039438101 and parameters: {'num_leaves': 262, 'min_data_in_leaf': 102,
'min_child_weight': 0.006411847245531891, 'max_depth': 37, 'bagging_fraction':
0.9069155308572121, 'feature_fraction': 0.5611265440953163, 'lambda_l1':
0.6462368256124963, 'lambda_l2': 0.20812489943251836}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4234562039438101

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:33:06,519] Trial 61 finished with value:
0.4225739804357605 and parameters: {'num_leaves': 316, 'min_data_in_leaf': 90,
'min_child_weight': 0.0053139783783685834, 'max_depth': 38, 'bagging_fraction':
0.5588990852565126, 'feature_fraction': 0.5798735537588768, 'lambda_l1':
0.966836760391185, 'lambda_l2': 0.18047130624232766}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225739804357605

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
```

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:33:18,992] Trial 62 finished with value:
0.42393829139797096 and parameters: {'num_leaves': 189, 'min_data_in_leaf': 85,
'min_child_weight': 0.009440024186171635, 'max_depth': 45, 'bagging_fraction':
0.6044601851553442, 'feature_fraction': 0.5420351789901596, 'lambda_l1':
0.7864347872660251, 'lambda_l2': 0.2392198395378245}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42393829139797096

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:33:29,693] Trial 63 finished with value:
0.42093966785533415 and parameters: {'num_leaves': 357, 'min_data_in_leaf': 109,
'min_child_weight': 0.003090464530284736, 'max_depth': 23, 'bagging_fraction':
0.5422991868504866, 'feature_fraction': 0.6260376212363167, 'lambda_l1':
1.1356353475359917, 'lambda_l2': 0.26551569999819197}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42093966785533415

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:33:41,820] Trial 64 finished with value:
0.4225806585881652 and parameters: {'num_leaves': 428, 'min_data_in_leaf': 120,
'min_child_weight': 0.002077960384861669, 'max_depth': 20, 'bagging_fraction':
0.5443205723513664, 'feature_fraction': 0.6232507321056613, 'lambda_l1':
1.385813657688977, 'lambda_l2': 0.2791072392017073}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225806585881652
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:33:55,035] Trial 65 finished with value:
0.4212390030820516 and parameters: {'num_leaves': 352, 'min_data_in_leaf': 107,
'min_child_weight': 0.001637371066417984, 'max_depth': 12, 'bagging_fraction':
0.5267787531570532, 'feature_fraction': 0.6046434735777302, 'lambda_l1':
1.1463082467699448, 'lambda_l2': 0.34036049431162685}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4212390030820516

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:34:06,636] Trial 66 finished with value:
0.4225904894830751 and parameters: {'num_leaves': 338, 'min_data_in_leaf': 108,
'min_child_weight': 0.0014327724253738756, 'max_depth': 12, 'bagging_fraction':
0.5278326858397293, 'feature_fraction': 0.6615337387272816, 'lambda_l1':
1.731986378561855, 'lambda_l2': 0.34856418989383575}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225904894830751

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:34:17,908] Trial 67 finished with value:
0.4350474879216299 and parameters: {'num_leaves': 133, 'min_data_in_leaf': 110,
```

'min_child_weight': 0.00325897884803884, 'max_depth': 1, 'bagging_fraction': 0.5005920842218677, 'feature_fraction': 0.6077521259672053, 'lambda_l1': 1.1639848690238461, 'lambda_l2': 0.41986987702262096}. Best is trial 21 with value: 0.4206535492796133.

LogLoss Score: 0.4350474879216299

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161: RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:34:30,614] Trial 68 finished with value: 0.42491737660552276 and parameters: {'num_leaves': 536, 'min_data_in_leaf': 120, 'min_child_weight': 0.0016004811734272857, 'max_depth': 22, 'bagging_fraction': 0.5143129594710097, 'feature_fraction': 0.6316055554985086, 'lambda_l1': 0.39689644493503645, 'lambda_l2': 0.30336965821459844}. Best is trial 21 with value: 0.4206535492796133.

LogLoss Score: 0.42491737660552276

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161: RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:34:40,546] Trial 69 finished with value: 0.4228382084745513 and parameters: {'num_leaves': 408, 'min_data_in_leaf': 148, 'min_child_weight': 0.004273312760559664, 'max_depth': 24, 'bagging_fraction': 0.5373580262014479, 'feature_fraction': 0.5946021773930047, 'lambda_l1': 1.4225007127199487, 'lambda_l2': 0.6357960728212722}. Best is trial 21 with value: 0.4206535492796133.

LogLoss Score: 0.4228382084745513

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:

```
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:34:50,387] Trial 70 finished with value:
0.42245107639483165 and parameters: {'num_leaves': 243, 'min_data_in_leaf': 137,
'min_child_weight': 0.002843607803574494, 'max_depth': 4, 'bagging_fraction':
0.5505338732492533, 'feature_fraction': 0.6179070557652705, 'lambda_l1':
1.9490115430369874, 'lambda_l2': 0.38262228057202247}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42245107639483165

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:35:09,780] Trial 71 finished with value:
0.4241644825206007 and parameters: {'num_leaves': 295, 'min_data_in_leaf': 101,
'min_child_weight': 0.001158182678442893, 'max_depth': 18, 'bagging_fraction':
0.5650605316088725, 'feature_fraction': 0.5761696818177201, 'lambda_l1':
1.0314611372861353, 'lambda_l2': 0.2669722245463049}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4241644825206007

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:35:26,542] Trial 72 finished with value:
0.42361210757737544 and parameters: {'num_leaves': 355, 'min_data_in_leaf': 95,
'min_child_weight': 0.007049479019756893, 'max_depth': 26, 'bagging_fraction':
0.5794884569711117, 'feature_fraction': 0.5530051086832327, 'lambda_l1':
0.9485912187007254, 'lambda_l2': 0.2307543281898963}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42361210757737544
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:35:40,642] Trial 73 finished with value:
0.4225432454025887 and parameters: {'num_leaves': 387, 'min_data_in_leaf': 126,
'min_child_weight': 0.002705961804889859, 'max_depth': 13, 'bagging_fraction':
0.523843290670527, 'feature_fraction': 0.5878077967934784, 'lambda_l1':
1.0836187894436105, 'lambda_l2': 0.29555291988922033}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.4225432454025887

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 07:36:05,164] Trial 74 finished with value:
0.42471668389496875 and parameters: {'num_leaves': 321, 'min_data_in_leaf': 77,
'min_child_weight': 0.011689973993629142, 'max_depth': 17, 'bagging_fraction':
0.552390943404194, 'feature_fraction': 0.6033136020068446, 'lambda_l1':
1.305622405861268, 'lambda_l2': 0.3332610788225839}. Best is trial 21 with
value: 0.4206535492796133.

LogLoss Score: 0.42471668389496875
```

[ ]:
```
study.best_trial
```

[ ]:
```
params={'num_leaves': 560, 'min_data_in_leaf': 189, 'min_child_weight': 0.
 ↪0024699349965224245, 'max_depth': 26, 'bagging_fraction': 0.
 ↪9753023991207269, 'feature_fraction': 0.7137858794613544, 'lambda_l1': 0.
 ↪5330703499296066, 'lambda_l2': 0.12028486914560135}

lgb_train = lgb.Dataset(data=train_df.astype('float32'), label=y_train.
 ↪astype('float32'))
lgb_valid = lgb.Dataset(data=dev_df.astype('float32'), label=y_dev.
 ↪astype('float32'))
```

```
estimator = lgb.train(params, lgb_train, 800, verbose_eval=0)

lgbm_probs = estimator.predict(dev_df)

from sklearn.metrics import roc_auc_score
roc_auc_score(y_dev,check)
```

[73]:
```
accuracy_score(y_dev, (lgbm_probs > 0.5).astype(int))
```

[73]: 0.843

2.0.1 Bagging LGBM

[34]:
```
classifiers = []

n_splits = 5
cv = StratifiedKFold(n_splits=n_splits, shuffle=True, random_state=42)
for train_idx, valid_idx in cv.split(train_df, y_train):
    params={'num_leaves': 560, 'min_data_in_leaf': 189, 'min_child_weight': 0.
 ↪0024699349965224245, \
            'max_depth': 26, 'bagging_fraction': 0.9753023991207269, \
            'feature_fraction': 0.7137858794613544, 'lambda_l1': 0.
 ↪5330703499296066, \
            'lambda_l2': 0.12028486914560135, \
           'objective': 'binary',
    'metric': 'binary_logloss',
    'boosting_type': 'gbdt',
    'boost_from_average': True,
    'num_threads': 4,
    'random_state': 42} # minimize
    x_train_train = train_df.iloc[train_idx]
    y_train_train = y_train.iloc[train_idx]
    x_train_valid = train_df.iloc[valid_idx]
    y_train_valid = y_train.iloc[valid_idx]

    lgb_train = lgb.Dataset(data=x_train_train.astype('float32'),␣
 ↪label=y_train_train.astype('float32'))
    lgb_valid = lgb.Dataset(data=x_train_valid.astype('float32'),␣
 ↪label=y_train_valid.astype('float32'))

    estimator = lgb.train(params, lgb_train, 10000, valid_sets=lgb_valid,
                          early_stopping_rounds=25, verbose_eval=0)
    classifiers.append(estimator)
```

[35]:
```
preds = []
for clf in classifiers:
    y_part = estimator.predict(dev_df, num_iteration=estimator.best_iteration)
    preds.append(y_part)
preds = np.mean(preds, axis=0)

check = (preds > 0.5).astype(int)
accuracy_score(y_dev, check)
```

[35]: 0.839

3 Random Forest

[37]:
```
from sklearn.metrics import accuracy_score, log_loss
from sklearn.model_selection import StratifiedKFold
import lightgbm as lgb
from sklearn import linear_model
from sklearn import ensemble
from sklearn import datasets
from sklearn import model_selection
def fit_predict(n_splits, params, x_train, y_train, x_test):

    oof = np.zeros(x_train.shape[0])

    y_preds = []

    cv = StratifiedKFold(n_splits=n_splits, shuffle=True, random_state=7)
    for train_idx, valid_idx in cv.split(x_train, y_train):

        x_train_train = train_df.iloc[train_idx]
        y_train_train = y_train.iloc[train_idx]
        x_train_valid = train_df.iloc[valid_idx]
        y_train_valid = y_train.iloc[valid_idx]

        estimator = ensemble.RandomForestClassifier(**params)
        estimator.fit(x_train_train, y_train_train)
        oof_part = estimator.predict(x_train_valid)
        oof[valid_idx] = oof_part

        if x_test is not None:
            y_part = estimator.predict(x_test)
            y_preds.append(y_part)

    score = accuracy_score(y_train, oof)
    print('Accuracy:', score)
```

```
    y_pred = np.mean(y_preds, axis=0)

    return y_pred, oof, score
```

[38]:
```
def objective(trial):
    # Categorical parameter
    params = {
    'criterion': trial.suggest_categorical('rf_criterion', ['gini']),

   'n_estimators': trial.suggest_int('n_estimators', 200, 400),
            'max_depth': trial.suggest_int('max_depth', 11, 18),
            'min_samples_split': trial.suggest_int('min_samples_split', 2, 15),
            'min_samples_leaf': trial.suggest_int('min_samples_leaf', 1, 15)
    }
    scores = []
    _, _, score = fit_predict(5, params, train_df, y_train, None)
    scores.append(score)

    return np.mean(scores)

study = optuna.create_study(direction='maximize')
study.optimize(objective, n_trials=30)
```

```
[I 2021-05-22 05:13:39,480] A new study created in memory with name:
no-name-c34a320d-112d-46ee-bb0f-ae086b944f2e
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 05:14:39,809] Trial 0 finished with value: 0.804625 and
parameters: {'rf_criterion': 'gini', 'n_estimators': 341, 'max_depth': 15,
'min_samples_split': 8, 'min_samples_leaf': 8}. Best is trial 0 with value:
0.804625.

Accuracy: 0.804625


 ␣
↪--------------------------------------------------------------------------
```

```
KeyboardInterrupt                         Traceback (most recent call␣
↪last)

<ipython-input-38-374708dbeb72> in <module>
 16
 17 study = optuna.create_study(direction='maximize')
---> 18 study.optimize(objective, n_trials=30)
 19 study.best_params


~/anaconda3/lib/python3.6/site-packages/optuna/study.py in␣
↪optimize(self, func, n_trials, timeout, n_jobs, catch, callbacks,␣
↪gc_after_trial, show_progress_bar)
407             callbacks=callbacks,
408             gc_after_trial=gc_after_trial,
--> 409             show_progress_bar=show_progress_bar,
410         )
411


~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_optimize(study, func, n_trials, timeout, n_jobs, catch, callbacks,␣
↪gc_after_trial, show_progress_bar)
 74                 reseed_sampler_rng=False,
 75                 time_start=None,
---> 76                 progress_bar=progress_bar,
 77             )
 78         else:


~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_optimize_sequential(study, func, n_trials, timeout, catch, callbacks,␣
↪gc_after_trial, reseed_sampler_rng, time_start, progress_bar)
161
162         try:
--> 163             trial = _run_trial(study, func, catch)
164         except Exception:
165             raise


~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_run_trial(study, func, catch)
215
216     try:
--> 217         value_or_values = func(trial)
218     except exceptions.TrialPruned as e:
219         # TODO(mamu): Handle multi-objective cases.
```

```
      <ipython-input-38-374708dbeb72> in objective(trial)
       10     }
       11     scores = []
  ---> 12     _, _, score = fit_predict(5, params, train_df, y_train, None)
       13     scores.append(score)
       14

      <ipython-input-37-d1f602095724> in fit_predict(n_splits, params,␣
↪x_train, y_train, x_test)
       21
       22         estimator = ensemble.RandomForestClassifier(**params)
  ---> 23         estimator.fit(x_train_train, y_train_train)
       24         oof_part = estimator.predict(x_train_valid)
       25         oof[valid_idx] = oof_part

      ~/anaconda3/lib/python3.6/site-packages/sklearn/ensemble/_forest.py in␣
↪fit(self, X, y, sample_weight)
      381                     verbose=self.verbose, class_weight=self.
↪class_weight,
      382                     n_samples_bootstrap=n_samples_bootstrap)
  --> 383                 for i, t in enumerate(trees))
      384
      385             # Collect newly grown trees

      ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪__call__(self, iterable)
     1005                 self._iterating = self._original_iterator is not None
     1006
  -> 1007             while self.dispatch_one_batch(iterator):
     1008                 pass
     1009

      ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪dispatch_one_batch(self, iterator)
      833                 return False
      834             else:
  --> 835                 self._dispatch(tasks)
      836                 return True
      837
```

```
       ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪_dispatch(self, batch)
       752         with self._lock:
       753             job_idx = len(self._jobs)
   --> 754             job = self._backend.apply_async(batch, callback=cb)
       755             # A job can complete so quickly than its callback is
       756             # called before we get here, causing self._jobs to


       ~/anaconda3/lib/python3.6/site-packages/joblib/_parallel_backends.py in␣
↪apply_async(self, func, callback)
       207     def apply_async(self, func, callback=None):
       208         """Schedule a func to be run"""
   --> 209         result = ImmediateResult(func)
       210         if callback:
       211             callback(result)


       ~/anaconda3/lib/python3.6/site-packages/joblib/_parallel_backends.py in␣
↪__init__(self, batch)
       588         # Don't delay the application, to avoid keeping the input
       589         # arguments in memory
   --> 590         self.results = batch()
       591
       592     def get(self):


       ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪__call__(self)
       254         with parallel_backend(self._backend, n_jobs=self._n_jobs):
       255             return [func(*args, **kwargs)
   --> 256                     for func, args, kwargs in self.items]
       257
       258     def __len__(self):


       ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪<listcomp>(.0)
       254         with parallel_backend(self._backend, n_jobs=self._n_jobs):
       255             return [func(*args, **kwargs)
   --> 256                     for func, args, kwargs in self.items]
       257
       258     def __len__(self):
```

```
        ~/anaconda3/lib/python3.6/site-packages/sklearn/ensemble/_forest.py in␣
↪_parallel_build_trees(tree, forest, X, y, sample_weight, tree_idx, n_trees,␣
↪verbose, class_weight, n_samples_bootstrap)
        163             curr_sample_weight *= compute_sample_weight('balanced',␣
↪y, indices)
        164
    --> 165         tree.fit(X, y, sample_weight=curr_sample_weight,␣
↪check_input=False)
        166     else:
        167         tree.fit(X, y, sample_weight=sample_weight,␣
↪check_input=False)


        ~/anaconda3/lib/python3.6/site-packages/sklearn/tree/_classes.py in␣
↪fit(self, X, y, sample_weight, check_input, X_idx_sorted)
        875             sample_weight=sample_weight,
        876             check_input=check_input,
    --> 877             X_idx_sorted=X_idx_sorted)
        878         return self
        879


        ~/anaconda3/lib/python3.6/site-packages/sklearn/tree/_classes.py in␣
↪fit(self, X, y, sample_weight, check_input, X_idx_sorted)
        365                                            min_impurity_split)
        366
    --> 367         builder.build(self.tree_, X, y, sample_weight, X_idx_sorted)
        368
        369         if self.n_outputs_ == 1 and is_classifier(self):


        KeyboardInterrupt:
```

[ ]:
```
study.best_params
```

[ ]:
```

```

[119]:
```
rf_pars = {'criterion': 'gini',
 'n_estimators': 342,
 'max_depth': 17,
 'min_samples_split': 6,
 'min_samples_leaf': 1}
```

[120]:
```
estimator = ensemble.RandomForestClassifier(**rf_pars)
estimator.fit(train_df, y_train)
```

```
rf_preds = estimator.predict(dev_df)
accuracy_score(y_dev, rf_preds)
```

[120]: 0.844

[121]:
```
rf_preds_proba = estimator.predict_proba(dev_df)
```

[124]:
```
accuracy_score(y_dev,(((lgbm_probs * 0.822 + rf_preds_proba[:, 1] * 0.8125) \
                       / (0.822 + 0.8125)) > 0.5).astype(int))
```

[124]: 0.853

4 Logistic Regression

[59]:
```
from sklearn.metrics import accuracy_score, log_loss
from sklearn.model_selection import StratifiedKFold
import lightgbm as lgb
from sklearn import linear_model
from sklearn import ensemble
from sklearn import datasets
from sklearn import model_selection
def fit_predict(n_splits, params, x_train, y_train, x_test):

    oof = np.zeros(x_train.shape[0])

    y_preds = []

    cv = StratifiedKFold(n_splits=n_splits, shuffle=True, random_state=7)
    for train_idx, valid_idx in cv.split(x_train, y_train):

        x_train_train = train_df.iloc[train_idx]
        y_train_train = y_train.iloc[train_idx]
        x_train_valid = train_df.iloc[valid_idx]
        y_train_valid = y_train.iloc[valid_idx]

        estimator = linear_model.LogisticRegression(**params)
        estimator.fit(x_train_train, y_train_train)
        oof_part = estimator.predict(x_train_valid)
        oof[valid_idx] = oof_part

        if x_test is not None:
            y_part = estimator.predict(x_test)
            y_preds.append(y_part)

    score = accuracy_score(y_train, oof)
```

```
    print('Accuracy:', score)

    y_pred = np.mean(y_preds, axis=0)

    return y_pred, oof, score
```

[60]:
```
from sklearn import preprocessing

scaler = preprocessing.MinMaxScaler()

train_df_scaled = scaler.fit_transform(train_df[train_df.columns])
dev_df_scaled = scaler.transform(dev_df[dev_df.columns])
```

[61]:
```
def objective(trial):
    # Categorical parameter
    params = {
        'penalty': trial.suggest_categorical('penalty', ['l1', 'l2']),
        'C' : trial.suggest_float("C", 1e-10, 1e10, log=True),
        'solver': trial.suggest_categorical('solver', ['saga']),
        'max_iter': trial.suggest_int('max_iter', 100, 500)
    }
    scores = []
    _, _, score = fit_predict(5, params, train_df_scaled, y_train, None)
    scores.append(score)

    return np.mean(scores)
```

[62]:
```
study = optuna.create_study(direction='maximize')
study.optimize(objective, n_trials=30)
```

```
[I 2021-05-22 05:39:29,698] A new study created in memory with name:
no-name-a737f855-461c-442c-ae58-b82cf60ef655
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge

/home/vsevolod/anaconda3/lib/python3.6/site-
packages/numpy/core/fromnumeric.py:3335: RuntimeWarning:

Mean of empty slice.

/home/vsevolod/anaconda3/lib/python3.6/site-packages/numpy/core/_methods.py:161:
RuntimeWarning:

invalid value encountered in double_scalars

[I 2021-05-22 05:41:38,539] Trial 0 finished with value: 0.786 and
parameters: {'penalty': 'l1', 'C': 11.045806818933906, 'solver': 'saga',
'max_iter': 486}. Best is trial 0 with value: 0.786.

Accuracy: 0.786


      ␣
↪------------------------------------------------------------------------

       KeyboardInterrupt                         Traceback (most recent call␣
↪last)

       <ipython-input-62-da5b7e186295> in <module>
         1 study = optuna.create_study(direction='maximize')
   ----> 2 study.optimize(objective, n_trials=30)


       ~/anaconda3/lib/python3.6/site-packages/optuna/study.py in␣
↪optimize(self, func, n_trials, timeout, n_jobs, catch, callbacks,␣
↪gc_after_trial, show_progress_bar)
       407             callbacks=callbacks,
       408             gc_after_trial=gc_after_trial,
   --> 409             show_progress_bar=show_progress_bar,
       410         )
       411
```

```
      ~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_optimize(study, func, n_trials, timeout, n_jobs, catch, callbacks,␣
↪gc_after_trial, show_progress_bar)
       74                 reseed_sampler_rng=False,
       75                 time_start=None,
  ---> 76                 progress_bar=progress_bar,
       77             )
       78         else:


      ~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_optimize_sequential(study, func, n_trials, timeout, catch, callbacks,␣
↪gc_after_trial, reseed_sampler_rng, time_start, progress_bar)
      161
      162         try:
  --> 163             trial = _run_trial(study, func, catch)
      164         except Exception:
      165             raise


      ~/anaconda3/lib/python3.6/site-packages/optuna/_optimize.py in␣
↪_run_trial(study, func, catch)
      215
      216     try:
  --> 217         value_or_values = func(trial)
      218     except exceptions.TrialPruned as e:
      219         # TODO(mamu): Handle multi-objective cases.


      <ipython-input-61-188366e0e4b8> in objective(trial)
        8     }
        9     scores = []
  ---> 10     _, _, score = fit_predict(5, params, train_df_scaled, y_train,␣
↪None)
       11     scores.append(score)
       12


      <ipython-input-59-f084d2979ed7> in fit_predict(n_splits, params,␣
↪x_train, y_train, x_test)
       21
       22         estimator = linear_model.LogisticRegression(**params)
  ---> 23         estimator.fit(x_train_train, y_train_train)
       24         oof_part = estimator.predict(x_train_valid)
       25         oof[valid_idx] = oof_part
```

```
      ~/anaconda3/lib/python3.6/site-packages/sklearn/linear_model/_logistic.
↪py in fit(self, X, y, sample_weight)
     1599                          penalty=penalty,␣
↪max_squared_sum=max_squared_sum,
     1600                          sample_weight=sample_weight)
  -> 1601             for class_, warm_start_coef_ in zip(classes_,␣
↪warm_start_coef))
     1602
     1603         fold_coefs_, _, n_iter_ = zip(*fold_coefs_)


      ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪__call__(self, iterable)
     1002             # remaining jobs.
     1003             self._iterating = False
  -> 1004             if self.dispatch_one_batch(iterator):
     1005                 self._iterating = self._original_iterator is not None
     1006


      ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪dispatch_one_batch(self, iterator)
      833                 return False
      834             else:
  --> 835                 self._dispatch(tasks)
      836                 return True
      837


      ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪_dispatch(self, batch)
      752         with self._lock:
      753             job_idx = len(self._jobs)
  --> 754             job = self._backend.apply_async(batch, callback=cb)
      755             # A job can complete so quickly than its callback is
      756             # called before we get here, causing self._jobs to


      ~/anaconda3/lib/python3.6/site-packages/joblib/_parallel_backends.py in␣
↪apply_async(self, func, callback)
      207     def apply_async(self, func, callback=None):
      208         """Schedule a func to be run"""
  --> 209         result = ImmediateResult(func)
      210         if callback:
      211             callback(result)
```

```
       ~/anaconda3/lib/python3.6/site-packages/joblib/_parallel_backends.py in␣
↪__init__(self, batch)
       588         # Don't delay the application, to avoid keeping the input
       589         # arguments in memory
   --> 590         self.results = batch()
       591
       592     def get(self):


       ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪__call__(self)
       254         with parallel_backend(self._backend, n_jobs=self._n_jobs):
       255             return [func(*args, **kwargs)
   --> 256                     for func, args, kwargs in self.items]
       257
       258     def __len__(self):


       ~/anaconda3/lib/python3.6/site-packages/joblib/parallel.py in␣
↪<listcomp>(.0)
       254         with parallel_backend(self._backend, n_jobs=self._n_jobs):
       255             return [func(*args, **kwargs)
   --> 256                     for func, args, kwargs in self.items]
       257
       258     def __len__(self):


       ~/anaconda3/lib/python3.6/site-packages/sklearn/linear_model/_logistic.
↪py in _logistic_regression_path(X, y, pos_class, Cs, fit_intercept, max_iter,␣
↪tol, verbose, solver, coef, class_weight, dual, penalty, intercept_scaling,␣
↪multi_class, random_state, check_input, max_squared_sum, sample_weight,␣
↪l1_ratio)
       975                 beta, max_iter, tol,
       976                 verbose, random_state, False, max_squared_sum,␣
↪warm_start_sag,
   --> 977                 is_saga=(solver == 'saga'))
       978
       979         else:


       ~/anaconda3/lib/python3.6/site-packages/sklearn/linear_model/_sag.py in␣
↪sag_solver(X, y, sample_weight, loss, alpha, beta, max_iter, tol, verbose,␣
↪random_state, check_input, max_squared_sum, warm_start_mem, is_saga)
       324                             intercept_decay,
       325                             is_saga,
   --> 326                             verbose)
       327
```

```
328     if n_iter_ == max_iter:

KeyboardInterrupt:
```

[ ]:
```
study.best_score
study.best_trial.value
```

[ ]:
```
lr_params = {'penalty': 'l2', 'C': 1.146016100950042, 'solver': 'saga',␣
↪'max_iter': 254}
```

[128]:
```
estimator = linear_model.LogisticRegression(**lr_params)
estimator.fit(train_df_scaled, y_train)
lr_preds = estimator.predict(dev_df_scaled)
lr_preds_proba = estimator.predict_proba(dev_df_scaled)
accuracy_score(y_dev, lr_preds)
```

```
/home/vsevolod/anaconda3/lib/python3.6/site-
packages/sklearn/linear_model/_sag.py:330: ConvergenceWarning:

The max_iter was reached which means the coef_ did not converge
```

[128]:
```
0.828
```

[130]:
```
roc_auc_score(y_dev, lr_preds_proba[:, 1])
```

[130]:
```
0.9123479999999999
```

5 Blend all

[131]:
```
lr_score = 0.74
lgbm_score = 0.822
rf_score = 0.8125
```

[132]:
```
accuracy_score(y_dev, (((lr_preds_proba[:, 1] * lr_score + rf_preds_proba[:, 1]␣
↪* rf_score + lgbm_probs * lgbm_score) \
                       / (lr_score + rf_score + lgbm_score)) > 0.5).
↪astype(int))
```

[132]:
```
0.845
```

[133]:
```
# Blend Best
```

[134]:
```
accuracy_score(y_dev,(((lgbm_probs * 0.822 + rf_preds_proba[:, 1] * 0.8125) \
                       / (0.822 + 0.8125)) > 0.5).astype(int))
```

[134]: 0.853

[ ]:
```

```