

CatBoost

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

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

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

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

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

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

1 Importing dataset

1.1 Defining data types

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

```

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

```

```

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

```

```

    'Census_InternalBatteryType':                                'category', #52 dropu
    ↵(null)
    'Census_InternalBatteryNumberOfCharges':                      'float32', #53 dropu
    ↵(bad data)
    'Census_OSVersions':                                         'category', #54 dropu
    ↵(Census_OSVersions = OsBuild + Census_OSBUILDRevision)
    'Census_OSSArchitecture':                                     'category', #55 Cat (3u
    ↵unique values)
    'Census_OSBranch':                                           'category', #56 Cat (30u
    ↵unique values)
    'Census_OSBUILDNumber':                                     'category', #57 Catu
    ↵(161 unique values)
    'Census_OSBUILDRevision':                                    'category', #58 Catu
    ↵(285 unique values)
    'Census_OSEdition':                                         'category', #59 Cat (32u
    ↵unique values)
    'Census_OSSkuName':                                         'category', #60 dropu
    ↵(almost same as Census_OSEdition)
    'Census_OSSInstallTypeNames':                               'category', #61 Cat (9u
    ↵unique values)
    'Census_OSSInstallLanguageIdentifier':                      'category', #62 Cat (40u
    ↵unique values)
    'Census_OSUILocaleIdentifier':                            'category', #63 Catu
    ↵(148 unique values)
    'Census_OSWUAutoUpdateOptionsName':                         'category', #64 Cat (6u
    ↵unique values)
    'Census_IsPortableOperatingSystem':                         'category', #65 Cat (2u
    ↵unique values)
    'Census_GenuineStateName':                                 'category', #66 Cat (5u
    ↵unique values)
    'Census_ActivationChannel':                               'category', #67 Cat (6u
    ↵unique values)
    'Census_IsFlightingInternal':                            'category', #68 dropu
    ↵(null)
    'Census_IsFlightsDisabled':                             'category', #69 Cat (2u
    ↵unique values)
    'Census_FlightRing':                                    'category', #70 Cat (10u
    ↵unique values)
    'Census_ThresholdOptIn':                                'category', #71 dropu
    ↵(null)
    'Census_FirmwareManufacturerIdentifier':                 'category', #72 Catu
    ↵(706 unique values)
    'Census_FirmwareVersionIdentifier':                     'category', #73 Catu
    ↵(50k unique values)

```

```

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

```

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

1.2 Importing dataset

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

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

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

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

2 Drop and transform features

2.1 Drop features by percentage of null values

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

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

output:

```
This function shows percentage of null values in each column.  
"""  
null_check = df.isnull().sum() / len(df) * 100  
print('Percentage of rows has null value %')  
print(null_check.loc[null_check != 0].sort_values(ascending=False))  
return null_check
```

```
[6]: null_check = display_nulls()  
columns_null = null_check.loc[null_check > 20].index  
df.drop(columns_null, axis=1, inplace=True)  
  
print("Initial number of features:  {} \\  
      \nRemaining number of features:  {} \\  
      \nNumber of columns dropped:      {}".format(83, len(df.keys()),  
→83-len(df.keys())))  
initial_features = len(df.keys())  
remaining_features = len(df.keys())
```

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

```

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

```

2.2 Drop duplicated features

- Census_OSVersioin: Census_OSVersioin = OsBuild + Census_OSBUILDRevision
 $(10.0.17134.165 = 10.0 + 17134 + 165)$
- OsBuildLab: OsBuildLab = OsBuild + Census_OSSArchitecture + Census_OSBranch
 $(17134.1.amd64fre.rs4_release.180410-1804 = OsBuild + 1 + Census_OSSArchitecture + Census_OSBranch + 180410-1804)$
- Census_OSSkuName: almost the same as Census_OSEdition

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

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

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

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

2.3 Drop meaningless features

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

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

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

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

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

2.4 Fix some category values

- Census_PrimaryDiskTypeName: merged ‘UNKNOWN’ category to ‘Unspecified’
- Census_PowerPlatformRoleName: merged ‘UNKNOWN’ category to ‘Unspecified’

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

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

2.5 Split some version features into numeric features

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

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

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

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

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

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

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

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

2.6 Drop features with not enough variation

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

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

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

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

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

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

2.7 Combine minor categories

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

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

```

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

```

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

2.8 Drop rows if categorical features have missing values

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

3 Feature selection

3.1 Drop HasDetections feature

'HasDetection' is our label feature (dependent variable).

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

3.2 List of remaining features

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

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

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

3.3 Three groups of features

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

```

'OsVer', 'OsBuild', 'OsSuite', 'OsPlatformSubRelease',
'OsBuildLab', 'SkuEdition', 'IsProtected', 'AutoSampleOptIn',
'PuaMode', 'SMode', 'IeVerIdentifier', 'SmartScreen',
    □
→ 'Firewall', 'UacLuaenable', 'Census_MDC2FormFactor', 'Census_OEMNameIdentifier', 'Census_OEMMod
    'Census_PrimaryDiskTotalCapacity', 'Census_PrimaryDiskTypeName', □
→ 'Census_HasOpticalDiskDrive',
    □
→ 'Census_PowerPlatformRoleName', 'Census_OSVersions', 'Census_OSSArchitecture', 'Census_OSBranch'
    □
→ 'Census_OSSBuildNumber', 'Census_OSSBuildRevision', 'Census_OSEdition', 'Census_OSSkuName', 'Cens
    □
→ 'Census_OSIInstallLanguageIdentifier', 'Census_OSUILocaleIdentifier', 'Census_OSWUAutoUpdateOp
    □
→ 'Census_IsPortableOperatingSystem', 'Census_GenuineStateName', 'Census_IsFlightingInternal',
    □
→ 'Census_IsFlightsDisabled', 'Census_FlightRing', 'Census_ThresholdOptIn', 'Census_IsSecureBoot
    □
→ 'Census_IsWIMBootEnabled', 'Census_IsVirtualDevice', 'Census_IsTouchEnabled', 'Census_IsPenCap
    'Census_IsAlwaysOnAlwaysConnectedCapable', 'Wdft_IsGamer']

```

```

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

"""

df_all = df

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

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

```

4 Training the dataset on CatBoost model

4.0.1 Model 1: CatBoost on all features

```
[19]: %%time

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

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

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

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

```
Train X: (5224247, 58)
Test X: (2238963, 58)
Train y: (5224247,)
Test y: (2238963,)
Learning rate set to 0.398593
0:    learn: 0.6759442      total: 7.02s      remaining: 1h 56m 52s
1:    learn: 0.6677295      total: 13.3s      remaining: 1h 51m 1s
2:    learn: 0.6638383      total: 19.2s      remaining: 1h 46m 30s
3:    learn: 0.6613658      total: 25.5s      remaining: 1h 45m 48s
4:    learn: 0.6589390      total: 31.8s      remaining: 1h 45m 33s
5:    learn: 0.6570357      total: 38.8s      remaining: 1h 47m
6:    learn: 0.6557182      total: 45.3s      remaining: 1h 47m 3s
7:    learn: 0.6545559      total: 51.3s      remaining: 1h 45m 56s
8:    learn: 0.6537700      total: 57.5s      remaining: 1h 45m 30s
9:    learn: 0.6530655      total: 1m 4s      remaining: 1h 46m 10s
10:   learn: 0.6522421     total: 1m 10s     remaining: 1h 45m 30s
11:   learn: 0.6515476     total: 1m 16s     remaining: 1h 45m 22s
12:   learn: 0.6506873     total: 1m 23s     remaining: 1h 45m 29s
13:   learn: 0.6501894     total: 1m 29s     remaining: 1h 45m 13s
14:   learn: 0.6496660     total: 1m 35s     remaining: 1h 44m 37s
15:   learn: 0.6492213     total: 1m 42s     remaining: 1h 44m 57s
16:   learn: 0.6488518     total: 1m 48s     remaining: 1h 44m 36s
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| 17: | learn: 0.6484032 | total: 1m 54s | remaining: 1h 44m 32s |
| 18: | learn: 0.6479627 | total: 2m 1s | remaining: 1h 44m 30s |
| 19: | learn: 0.6475005 | total: 2m 7s | remaining: 1h 44m 22s |
| 20: | learn: 0.6470077 | total: 2m 13s | remaining: 1h 44m 5s |
| 21: | learn: 0.6465664 | total: 2m 20s | remaining: 1h 43m 57s |
| 22: | learn: 0.6463029 | total: 2m 26s | remaining: 1h 43m 38s |
| 23: | learn: 0.6460797 | total: 2m 32s | remaining: 1h 43m 20s |
| 24: | learn: 0.6457289 | total: 2m 39s | remaining: 1h 43m 21s |
| 25: | learn: 0.6454631 | total: 2m 45s | remaining: 1h 43m 16s |
| 26: | learn: 0.6452922 | total: 2m 51s | remaining: 1h 43m 6s |
| 27: | learn: 0.6449788 | total: 2m 57s | remaining: 1h 42m 49s |
| 28: | learn: 0.6447384 | total: 3m 4s | remaining: 1h 42m 53s |
| 29: | learn: 0.6444473 | total: 3m 10s | remaining: 1h 42m 47s |
| 30: | learn: 0.6442435 | total: 3m 16s | remaining: 1h 42m 37s |
| 31: | learn: 0.6440049 | total: 3m 22s | remaining: 1h 42m 19s |
| 32: | learn: 0.6438278 | total: 3m 28s | remaining: 1h 41m 44s |
| 33: | learn: 0.6434833 | total: 3m 34s | remaining: 1h 41m 31s |
| 34: | learn: 0.6432487 | total: 3m 41s | remaining: 1h 41m 45s |
| 35: | learn: 0.6430209 | total: 3m 48s | remaining: 1h 42m 10s |
| 36: | learn: 0.6428682 | total: 3m 55s | remaining: 1h 42m 18s |
| 37: | learn: 0.6426554 | total: 4m 2s | remaining: 1h 42m 14s |
| 38: | learn: 0.6424625 | total: 4m 8s | remaining: 1h 42m 2s |
| 39: | learn: 0.6421192 | total: 4m 14s | remaining: 1h 41m 48s |
| 40: | learn: 0.6418203 | total: 4m 21s | remaining: 1h 41m 53s |
| 41: | learn: 0.6416639 | total: 4m 28s | remaining: 1h 41m 57s |
| 42: | learn: 0.6415026 | total: 4m 34s | remaining: 1h 41m 54s |
| 43: | learn: 0.6413400 | total: 4m 41s | remaining: 1h 41m 46s |
| 44: | learn: 0.6411901 | total: 4m 47s | remaining: 1h 41m 39s |
| 45: | learn: 0.6410552 | total: 4m 53s | remaining: 1h 41m 17s |
| 46: | learn: 0.6409002 | total: 4m 59s | remaining: 1h 41m 18s |
| 47: | learn: 0.6407005 | total: 5m 6s | remaining: 1h 41m 15s |
| 48: | learn: 0.6404982 | total: 5m 12s | remaining: 1h 41m 10s |
| 49: | learn: 0.6403693 | total: 5m 19s | remaining: 1h 41m 18s |
| 50: | learn: 0.6402415 | total: 5m 27s | remaining: 1h 41m 40s |
| 51: | learn: 0.6401325 | total: 5m 35s | remaining: 1h 41m 59s |
| 52: | learn: 0.6400068 | total: 5m 43s | remaining: 1h 42m 23s |
| 53: | learn: 0.6398689 | total: 5m 52s | remaining: 1h 43m |
| 54: | learn: 0.6397578 | total: 6m | remaining: 1h 43m 15s |
| 55: | learn: 0.6396120 | total: 6m 7s | remaining: 1h 43m 17s |
| 56: | learn: 0.6395388 | total: 6m 14s | remaining: 1h 43m 8s |
| 57: | learn: 0.6394131 | total: 6m 19s | remaining: 1h 42m 47s |
| 58: | learn: 0.6392704 | total: 6m 26s | remaining: 1h 42m 38s |
| 59: | learn: 0.6391560 | total: 6m 32s | remaining: 1h 42m 28s |
| 60: | learn: 0.6390555 | total: 6m 39s | remaining: 1h 42m 25s |
| 61: | learn: 0.6389551 | total: 6m 46s | remaining: 1h 42m 28s |
| 62: | learn: 0.6387764 | total: 6m 53s | remaining: 1h 42m 33s |
| 63: | learn: 0.6386323 | total: 7m | remaining: 1h 42m 31s |
| 64: | learn: 0.6385220 | total: 7m 8s | remaining: 1h 42m 41s |

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

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113: learn: 0.6346477 total: 12m 40s remaining: 1h 38m 27s
114: learn: 0.6345970 total: 12m 46s remaining: 1h 38m 19s
115: learn: 0.6345364 total: 12m 52s remaining: 1h 38m 9s
116: learn: 0.6344838 total: 12m 59s remaining: 1h 38m 1s
117: learn: 0.6344408 total: 13m 5s remaining: 1h 37m 53s
118: learn: 0.6343947 total: 13m 11s remaining: 1h 37m 42s
119: learn: 0.6343509 total: 13m 18s remaining: 1h 37m 35s
120: learn: 0.6343100 total: 13m 24s remaining: 1h 37m 24s
121: learn: 0.6342735 total: 13m 31s remaining: 1h 37m 18s
122: learn: 0.6342177 total: 13m 37s remaining: 1h 37m 10s
123: learn: 0.6341751 total: 13m 44s remaining: 1h 37m 4s
124: learn: 0.6341420 total: 13m 50s remaining: 1h 36m 56s
125: learn: 0.6340786 total: 13m 56s remaining: 1h 36m 43s
126: learn: 0.6340523 total: 14m 3s remaining: 1h 36m 36s
127: learn: 0.6339709 total: 14m 10s remaining: 1h 36m 30s
128: learn: 0.6339208 total: 14m 16s remaining: 1h 36m 22s
129: learn: 0.6338603 total: 14m 23s remaining: 1h 36m 17s
130: learn: 0.6338101 total: 14m 29s remaining: 1h 36m 4s
131: learn: 0.6337856 total: 14m 35s remaining: 1h 35m 57s
132: learn: 0.6337476 total: 14m 42s remaining: 1h 35m 52s
133: learn: 0.6337150 total: 14m 49s remaining: 1h 35m 46s
134: learn: 0.6336668 total: 14m 55s remaining: 1h 35m 38s
135: learn: 0.6336333 total: 15m 2s remaining: 1h 35m 30s
136: learn: 0.6335862 total: 15m 7s remaining: 1h 35m 18s
137: learn: 0.6335372 total: 15m 14s remaining: 1h 35m 11s
138: learn: 0.6334854 total: 15m 21s remaining: 1h 35m 6s
139: learn: 0.6334313 total: 15m 27s remaining: 1h 35m
140: learn: 0.6333850 total: 15m 34s remaining: 1h 34m 54s
141: learn: 0.6333257 total: 15m 41s remaining: 1h 34m 46s
142: learn: 0.6332731 total: 15m 46s remaining: 1h 34m 34s
143: learn: 0.6332258 total: 15m 53s remaining: 1h 34m 27s
144: learn: 0.6331889 total: 15m 59s remaining: 1h 34m 19s
145: learn: 0.6331582 total: 16m 6s remaining: 1h 34m 12s
146: learn: 0.6331312 total: 16m 12s remaining: 1h 34m 4s
147: learn: 0.6331002 total: 16m 18s remaining: 1h 33m 55s
148: learn: 0.6330805 total: 16m 25s remaining: 1h 33m 47s
149: learn: 0.6330457 total: 16m 31s remaining: 1h 33m 40s
150: learn: 0.6329814 total: 16m 38s remaining: 1h 33m 35s
151: learn: 0.6329496 total: 16m 44s remaining: 1h 33m 26s
152: learn: 0.6328973 total: 16m 52s remaining: 1h 33m 22s
153: learn: 0.6328615 total: 16m 58s remaining: 1h 33m 14s
154: learn: 0.6328099 total: 17m 5s remaining: 1h 33m 9s
155: learn: 0.6327662 total: 17m 11s remaining: 1h 33m 2s
156: learn: 0.6327295 total: 17m 18s remaining: 1h 32m 57s
157: learn: 0.6326930 total: 17m 24s remaining: 1h 32m 48s
158: learn: 0.6326489 total: 17m 31s remaining: 1h 32m 41s
159: learn: 0.6326120 total: 17m 37s remaining: 1h 32m 31s
160: learn: 0.6325672 total: 17m 44s remaining: 1h 32m 25s
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| 161: | learn: 0.6325338 | total: 17m 50s | remaining: 1h 32m 15s |
| 162: | learn: 0.6325080 | total: 17m 56s | remaining: 1h 32m 5s |
| 163: | learn: 0.6324642 | total: 18m 2s | remaining: 1h 31m 58s |
| 164: | learn: 0.6324261 | total: 18m 9s | remaining: 1h 31m 52s |
| 165: | learn: 0.6323896 | total: 18m 16s | remaining: 1h 31m 47s |
| 166: | learn: 0.6323422 | total: 18m 22s | remaining: 1h 31m 40s |
| 167: | learn: 0.6323090 | total: 18m 28s | remaining: 1h 31m 31s |
| 168: | learn: 0.6322797 | total: 18m 34s | remaining: 1h 31m 21s |
| 169: | learn: 0.6322364 | total: 18m 40s | remaining: 1h 31m 12s |
| 170: | learn: 0.6322077 | total: 18m 47s | remaining: 1h 31m 4s |
| 171: | learn: 0.6321913 | total: 18m 53s | remaining: 1h 30m 57s |
| 172: | learn: 0.6321382 | total: 18m 59s | remaining: 1h 30m 49s |
| 173: | learn: 0.6321085 | total: 19m 6s | remaining: 1h 30m 40s |
| 174: | learn: 0.6320716 | total: 19m 12s | remaining: 1h 30m 32s |
| 175: | learn: 0.6320454 | total: 19m 18s | remaining: 1h 30m 21s |
| 176: | learn: 0.6320229 | total: 19m 24s | remaining: 1h 30m 15s |
| 177: | learn: 0.6319957 | total: 19m 30s | remaining: 1h 30m 7s |
| 178: | learn: 0.6319558 | total: 19m 36s | remaining: 1h 29m 58s |
| 179: | learn: 0.6319143 | total: 19m 43s | remaining: 1h 29m 49s |
| 180: | learn: 0.6318772 | total: 19m 49s | remaining: 1h 29m 42s |
| 181: | learn: 0.6318478 | total: 19m 55s | remaining: 1h 29m 34s |
| 182: | learn: 0.6318177 | total: 20m 2s | remaining: 1h 29m 28s |
| 183: | learn: 0.6317778 | total: 20m 8s | remaining: 1h 29m 20s |
| 184: | learn: 0.6317510 | total: 20m 15s | remaining: 1h 29m 13s |
| 185: | learn: 0.6317247 | total: 20m 21s | remaining: 1h 29m 4s |
| 186: | learn: 0.6317064 | total: 20m 27s | remaining: 1h 28m 57s |
| 187: | learn: 0.6316709 | total: 20m 34s | remaining: 1h 28m 51s |
| 188: | learn: 0.6316530 | total: 20m 41s | remaining: 1h 28m 46s |
| 189: | learn: 0.6316190 | total: 20m 48s | remaining: 1h 28m 40s |
| 190: | learn: 0.6315898 | total: 20m 54s | remaining: 1h 28m 32s |
| 191: | learn: 0.6315554 | total: 21m | remaining: 1h 28m 25s |
| 192: | learn: 0.6315217 | total: 21m 7s | remaining: 1h 28m 18s |
| 193: | learn: 0.6315072 | total: 21m 12s | remaining: 1h 28m 6s |
| 194: | learn: 0.6314887 | total: 21m 18s | remaining: 1h 27m 58s |
| 195: | learn: 0.6314616 | total: 21m 24s | remaining: 1h 27m 50s |
| 196: | learn: 0.6314311 | total: 21m 31s | remaining: 1h 27m 42s |
| 197: | learn: 0.6313969 | total: 21m 37s | remaining: 1h 27m 36s |
| 198: | learn: 0.6313678 | total: 21m 44s | remaining: 1h 27m 29s |
| 199: | learn: 0.6313367 | total: 21m 50s | remaining: 1h 27m 23s |
| 200: | learn: 0.6313039 | total: 21m 57s | remaining: 1h 27m 16s |
| 201: | learn: 0.6312839 | total: 22m 3s | remaining: 1h 27m 9s |
| 202: | learn: 0.6312551 | total: 22m 10s | remaining: 1h 27m 2s |
| 203: | learn: 0.6312308 | total: 22m 15s | remaining: 1h 26m 52s |
| 204: | learn: 0.6312079 | total: 22m 22s | remaining: 1h 26m 45s |
| 205: | learn: 0.6311753 | total: 22m 29s | remaining: 1h 26m 41s |
| 206: | learn: 0.6311578 | total: 22m 35s | remaining: 1h 26m 31s |
| 207: | learn: 0.6311414 | total: 22m 41s | remaining: 1h 26m 25s |
| 208: | learn: 0.6311113 | total: 22m 47s | remaining: 1h 26m 15s |

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

```

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

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

```

```
[20]: %%time

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

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

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

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

Accuracy in training set: 0.650

```

Accuracy in testing set: 0.645

AUC in training set: 0.708
AUC in testing set: 0.700
CPU times: user 7min 16s, sys: 7.76 s, total: 7min 24s
Wall time: 1min 42s

```

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

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

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

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

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


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

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

```

```

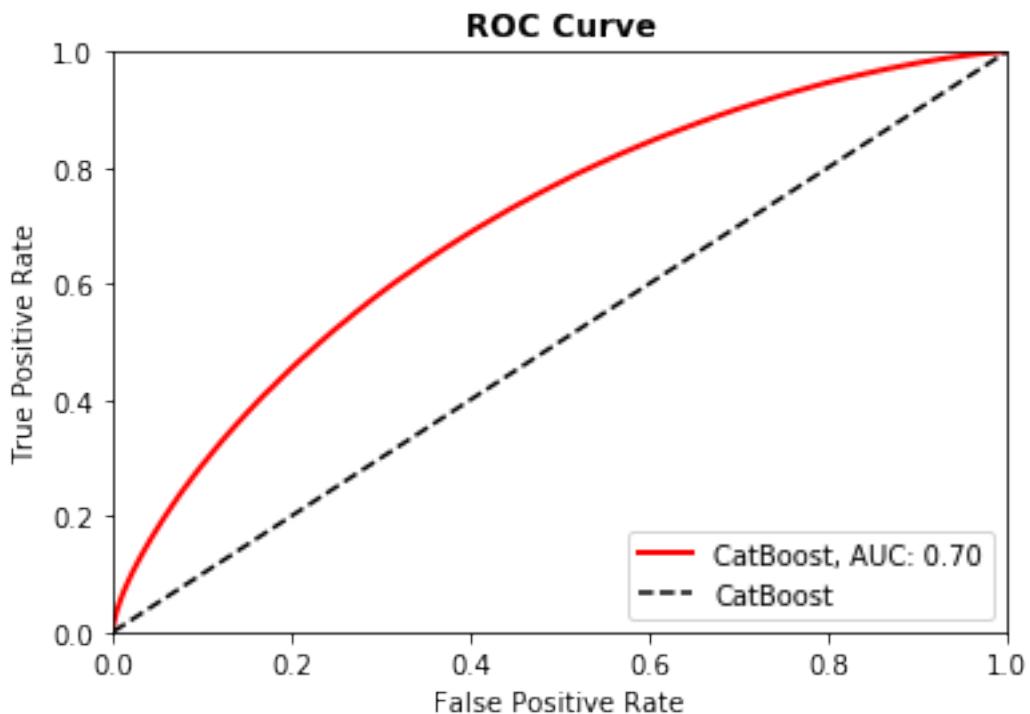
    cm = np.round(cm, 2)
    print("Normalized confusion matrix")
else:
    print('Confusion matrix, without normalization')

print(cm)

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

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

```



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

```

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

```

```

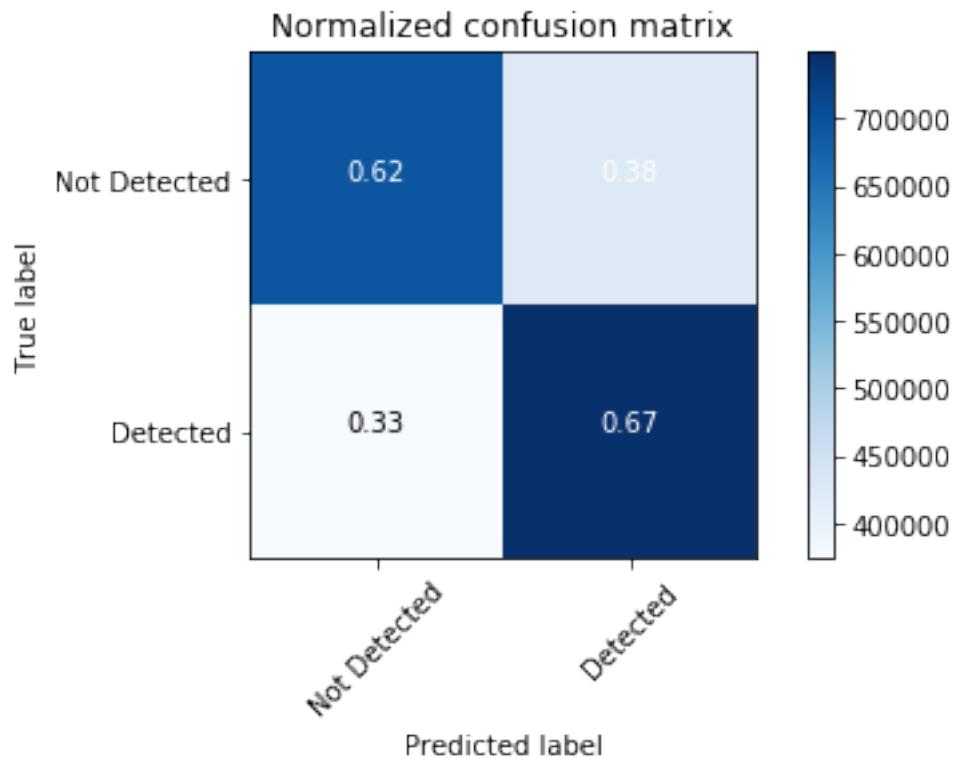
# Compute confusion matrix
cm = confusion_matrix(y_test, y_pred)

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

plt.show()

```

Normalized confusion matrix
[[0.62 0.38]
 [0.33 0.67]]



4.0.2 Model 2: CatBoost on all settings features

```

[23]: %%time

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

```

```

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

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

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

```

```

Train X: (5224247, 30)
Test  X: (2238963, 30)
Train y: (5224247,)
Test  y: (2238963,)
Learning rate set to 0.398593
0:    learn: 0.6790631      total: 4.89s  remaining: 1h 21m 30s
1:    learn: 0.6731889      total: 9.63s  remaining: 1h 20m 7s
2:    learn: 0.6703177      total: 14s    remaining: 1h 17m 23s
3:    learn: 0.6682764      total: 18.4s  remaining: 1h 16m 27s
4:    learn: 0.6669550      total: 23.2s  remaining: 1h 17m 5s
5:    learn: 0.6661800      total: 27.5s  remaining: 1h 15m 59s
6:    learn: 0.6654038      total: 32.2s  remaining: 1h 16m 6s
7:    learn: 0.6648188      total: 36.8s  remaining: 1h 16m
8:    learn: 0.6639966      total: 41.3s  remaining: 1h 15m 45s
9:    learn: 0.6632676      total: 45.9s  remaining: 1h 15m 48s
10:   learn: 0.6628551     total: 50.5s  remaining: 1h 15m 39s
11:   learn: 0.6625187     total: 54.9s  remaining: 1h 15m 16s
12:   learn: 0.6621038     total: 59.4s  remaining: 1h 15m 8s
13:   learn: 0.6618134     total: 1m 4s   remaining: 1h 15m 21s
14:   learn: 0.6614745     total: 1m 8s   remaining: 1h 15m 22s
15:   learn: 0.6611472     total: 1m 13s  remaining: 1h 15m 15s
16:   learn: 0.6609195     total: 1m 18s  remaining: 1h 15m 11s
17:   learn: 0.6606455     total: 1m 22s  remaining: 1h 15m 26s
18:   learn: 0.6604261     total: 1m 27s  remaining: 1h 15m 28s
19:   learn: 0.6602105     total: 1m 32s  remaining: 1h 15m 28s
20:   learn: 0.6600315     total: 1m 36s  remaining: 1h 15m 1s
21:   learn: 0.6598510     total: 1m 41s  remaining: 1h 14m 59s
22:   learn: 0.6597243     total: 1m 45s  remaining: 1h 14m 43s
23:   learn: 0.6594944     total: 1m 49s  remaining: 1h 14m 6s
24:   learn: 0.6593440     total: 1m 53s  remaining: 1h 13m 58s
25:   learn: 0.6592133     total: 1m 58s  remaining: 1h 14m 11s

```

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

```

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

CPU times: user 14h 49min 53s, sys: 7min 7s, total: 14h 57min
Wall time: 1h 19min 26s

```

```
[24]: %%time

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

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

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

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

```

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

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

```

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

```

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

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

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

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


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

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

    print(cm)

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

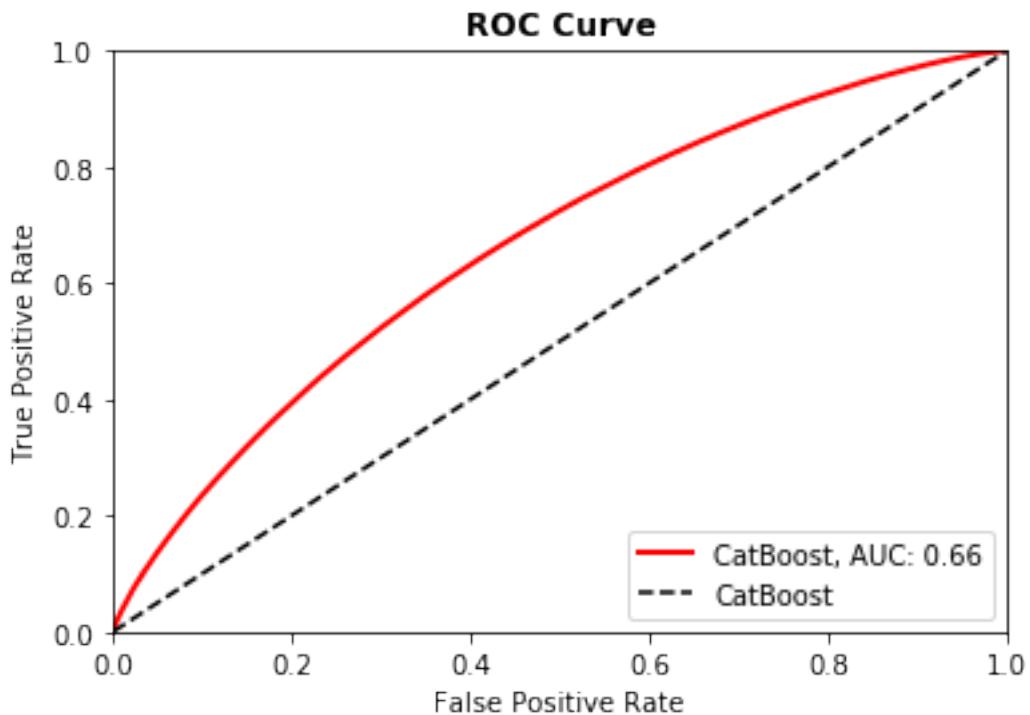
```

```

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

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

```



```

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

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

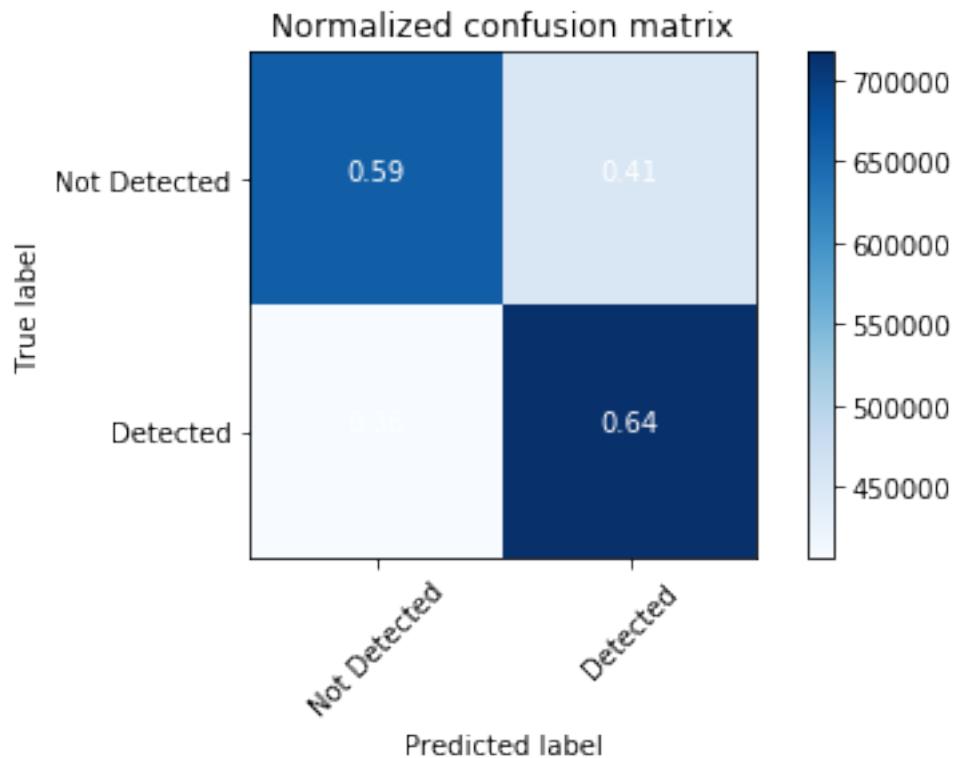
# Compute confusion matrix
cm = confusion_matrix(y_test, y_pred)

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

plt.show()

```

```
Normalized confusion matrix  
[[0.59 0.41]  
 [0.36 0.64]]
```



4.0.3 Model 3: CatBoost on all features except settings

```
[27]: %%time  
  
df_cat = df_notsettings  
# Splitting features into test and train sets  
X_train, X_test, y_train, y_test = train_test_split(df_cat, np.array(label),  
                                                 test_size=0.3, random_state=42)  
  
print('Train X: {}'.format(X_train.shape))  
print('Test X: {}'.format(X_test.shape))  
print('Train y: {}'.format(y_train.shape))  
print('Test y: {}'.format(y_test.shape))  
  
# Get categorical columns  
columns = df_cat.columns  
types = df_cat.dtypes  
columns_cat = list(types[types == 'category'].index)
```

```

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

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

```

Train X: (5224247, 28)
 Test X: (2238963, 28)
 Train y: (5224247,)
 Test y: (2238963,)
 Learning rate set to 0.398593

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

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

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

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

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

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

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276: learn: 0.6429593      total: 10m 21s  remaining: 27m 1s
277: learn: 0.6429484      total: 10m 23s  remaining: 26m 59s
278: learn: 0.6429413      total: 10m 25s  remaining: 26m 56s
279: learn: 0.6429334      total: 10m 27s  remaining: 26m 54s
280: learn: 0.6429206      total: 10m 30s  remaining: 26m 52s
281: learn: 0.6429134      total: 10m 32s  remaining: 26m 50s
282: learn: 0.6429079      total: 10m 34s  remaining: 26m 47s
283: learn: 0.6428988      total: 10m 36s  remaining: 26m 45s
284: learn: 0.6428835      total: 10m 38s  remaining: 26m 42s
285: learn: 0.6428748      total: 10m 41s  remaining: 26m 40s
286: learn: 0.6428611      total: 10m 43s  remaining: 26m 38s
287: learn: 0.6428488      total: 10m 45s  remaining: 26m 36s
288: learn: 0.6428406      total: 10m 47s  remaining: 26m 33s
289: learn: 0.6428334      total: 10m 50s  remaining: 26m 31s
290: learn: 0.6428175      total: 10m 52s  remaining: 26m 29s
291: learn: 0.6428110      total: 10m 54s  remaining: 26m 26s
292: learn: 0.6427849      total: 10m 56s  remaining: 26m 24s
293: learn: 0.6427735      total: 10m 58s  remaining: 26m 21s
294: learn: 0.6427643      total: 11m    remaining: 26m 18s
295: learn: 0.6427452      total: 11m 2s   remaining: 26m 16s
296: learn: 0.6427390      total: 11m 4s   remaining: 26m 13s
297: learn: 0.6427263      total: 11m 7s   remaining: 26m 11s
298: learn: 0.6427173      total: 11m 9s   remaining: 26m 9s
299: learn: 0.6427106      total: 11m 11s  remaining: 26m 6s
300: learn: 0.6426986      total: 11m 13s  remaining: 26m 4s
301: learn: 0.6426903      total: 11m 15s  remaining: 26m 2s
302: learn: 0.6426757      total: 11m 18s  remaining: 26m
303: learn: 0.6426668      total: 11m 20s  remaining: 25m 57s
304: learn: 0.6426611      total: 11m 22s  remaining: 25m 56s
305: learn: 0.6426504      total: 11m 25s  remaining: 25m 54s
306: learn: 0.6426358      total: 11m 27s  remaining: 25m 51s
307: learn: 0.6426283      total: 11m 29s  remaining: 25m 50s
308: learn: 0.6426189      total: 11m 32s  remaining: 25m 47s
309: learn: 0.6426063      total: 11m 34s  remaining: 25m 45s
310: learn: 0.6425982      total: 11m 36s  remaining: 25m 43s
311: learn: 0.6425883      total: 11m 38s  remaining: 25m 40s
312: learn: 0.6425831      total: 11m 41s  remaining: 25m 38s
313: learn: 0.6425746      total: 11m 43s  remaining: 25m 36s
314: learn: 0.6425711      total: 11m 45s  remaining: 25m 34s
315: learn: 0.6425554      total: 11m 47s  remaining: 25m 31s
316: learn: 0.6425223      total: 11m 50s  remaining: 25m 29s
317: learn: 0.6425103      total: 11m 52s  remaining: 25m 27s
318: learn: 0.6424970      total: 11m 54s  remaining: 25m 24s
319: learn: 0.6424909      total: 11m 56s  remaining: 25m 22s
320: learn: 0.6424868      total: 11m 58s  remaining: 25m 20s
321: learn: 0.6424847      total: 12m 1s   remaining: 25m 18s
322: learn: 0.6424808      total: 12m 3s   remaining: 25m 15s
323: learn: 0.6424712      total: 12m 5s   remaining: 25m 13s
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| 324: | learn: 0.6424581 | total: 12m 7s | remaining: 25m 10s |
| 325: | learn: 0.6424503 | total: 12m 9s | remaining: 25m 8s |
| 326: | learn: 0.6424410 | total: 12m 11s | remaining: 25m 6s |
| 327: | learn: 0.6424271 | total: 12m 13s | remaining: 25m 3s |
| 328: | learn: 0.6424194 | total: 12m 16s | remaining: 25m 2s |
| 329: | learn: 0.6424128 | total: 12m 18s | remaining: 24m 59s |
| 330: | learn: 0.6424052 | total: 12m 21s | remaining: 24m 57s |
| 331: | learn: 0.6423985 | total: 12m 23s | remaining: 24m 55s |
| 332: | learn: 0.6423858 | total: 12m 25s | remaining: 24m 53s |
| 333: | learn: 0.6423789 | total: 12m 27s | remaining: 24m 50s |
| 334: | learn: 0.6423709 | total: 12m 29s | remaining: 24m 48s |
| 335: | learn: 0.6423673 | total: 12m 31s | remaining: 24m 46s |
| 336: | learn: 0.6423607 | total: 12m 34s | remaining: 24m 44s |
| 337: | learn: 0.6423579 | total: 12m 36s | remaining: 24m 41s |
| 338: | learn: 0.6423398 | total: 12m 38s | remaining: 24m 38s |
| 339: | learn: 0.6423266 | total: 12m 40s | remaining: 24m 36s |
| 340: | learn: 0.6423196 | total: 12m 43s | remaining: 24m 34s |
| 341: | learn: 0.6423112 | total: 12m 45s | remaining: 24m 32s |
| 342: | learn: 0.6423022 | total: 12m 47s | remaining: 24m 30s |
| 343: | learn: 0.6422997 | total: 12m 49s | remaining: 24m 28s |
| 344: | learn: 0.6422857 | total: 12m 52s | remaining: 24m 25s |
| 345: | learn: 0.6422806 | total: 12m 53s | remaining: 24m 22s |
| 346: | learn: 0.6422763 | total: 12m 56s | remaining: 24m 20s |
| 347: | learn: 0.6422710 | total: 12m 58s | remaining: 24m 18s |
| 348: | learn: 0.6422663 | total: 13m 1s | remaining: 24m 16s |
| 349: | learn: 0.6422588 | total: 13m 3s | remaining: 24m 14s |
| 350: | learn: 0.6422478 | total: 13m 5s | remaining: 24m 12s |
| 351: | learn: 0.6422335 | total: 13m 8s | remaining: 24m 11s |
| 352: | learn: 0.6422322 | total: 13m 10s | remaining: 24m 8s |
| 353: | learn: 0.6422247 | total: 13m 13s | remaining: 24m 7s |
| 354: | learn: 0.6422165 | total: 13m 15s | remaining: 24m 5s |
| 355: | learn: 0.6422077 | total: 13m 18s | remaining: 24m 3s |
| 356: | learn: 0.6422024 | total: 13m 20s | remaining: 24m 1s |
| 357: | learn: 0.6421992 | total: 13m 23s | remaining: 24m |
| 358: | learn: 0.6421920 | total: 13m 25s | remaining: 23m 59s |
| 359: | learn: 0.6421812 | total: 13m 28s | remaining: 23m 56s |
| 360: | learn: 0.6421761 | total: 13m 30s | remaining: 23m 54s |
| 361: | learn: 0.6421700 | total: 13m 32s | remaining: 23m 52s |
| 362: | learn: 0.6421612 | total: 13m 34s | remaining: 23m 50s |
| 363: | learn: 0.6421497 | total: 13m 36s | remaining: 23m 47s |
| 364: | learn: 0.6421413 | total: 13m 39s | remaining: 23m 45s |
| 365: | learn: 0.6421336 | total: 13m 41s | remaining: 23m 42s |
| 366: | learn: 0.6421253 | total: 13m 43s | remaining: 23m 40s |
| 367: | learn: 0.6421106 | total: 13m 45s | remaining: 23m 38s |
| 368: | learn: 0.6420936 | total: 13m 47s | remaining: 23m 35s |
| 369: | learn: 0.6420827 | total: 13m 50s | remaining: 23m 33s |
| 370: | learn: 0.6420628 | total: 13m 52s | remaining: 23m 31s |
| 371: | learn: 0.6420522 | total: 13m 54s | remaining: 23m 29s |

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

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

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

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

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

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

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

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

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

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

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

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

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

```

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

```

[28]: `%%time`

```

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

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

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

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

```

```

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

```

```

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

```

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

```

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

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

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

```

```

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

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


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

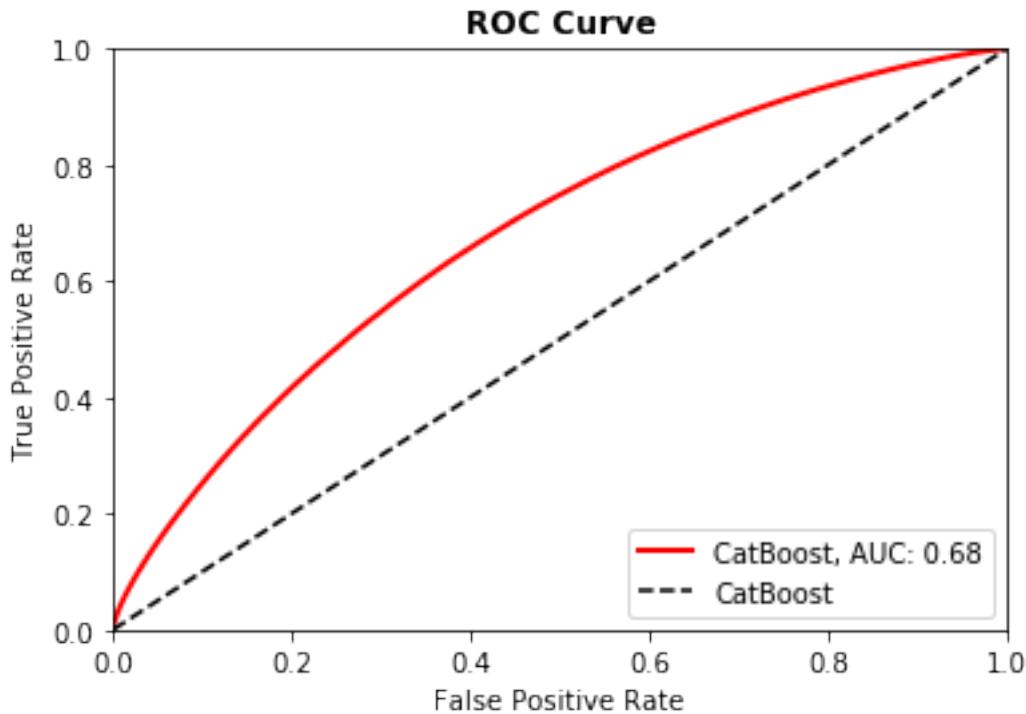
    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
        cm = np.round(cm, 2)
        print("Normalized confusion matrix")
    else:
        print('Confusion matrix, without normalization')

    print(cm)

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

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

```



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

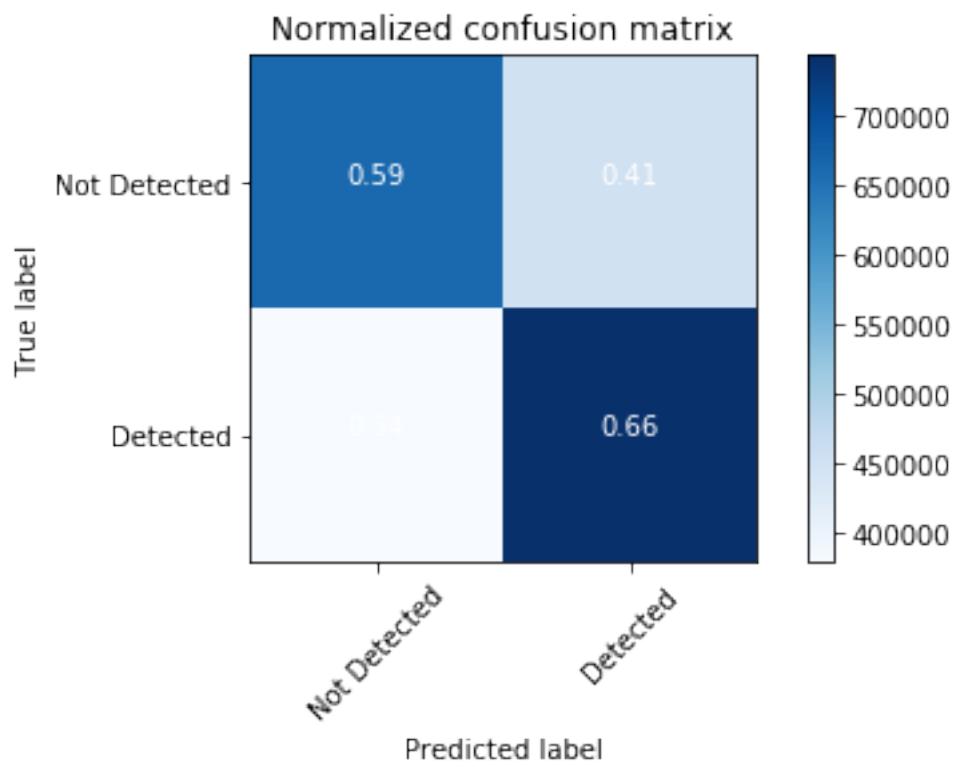
y_pred = pred_test
class_names = ['Not Detected', 'Detected']

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

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

plt.show()
```

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



[]: