Configuration

In [1]:
```python
# Parameters
ENABLE_COLAB = False

PROJECT_NAME = 'ML1010-Group-Project'
EXPERIMENT_NAME = 'ReviewText_Lemma_Bert2 (XGB_Tune)'
FILE_NAME = '01_ML1010_GP_XGB_Bert2_Tune'
LOAD_FROM_EXP = False

#Root Machine Learning Directory. Projects appear underneath
GOOGLE_DRIVE_MOUNT = '/content/gdrive'
COLAB_ROOT_DIR = GOOGLE_DRIVE_MOUNT + '/MyDrive/Colab Notebooks'
COLAB_INIT_DIR = COLAB_ROOT_DIR + '/utility_files'

LOCAL_ROOT_DIR = '/home/magni//ML_Root/project_root'
LOCAL_INIT_DIR = LOCAL_ROOT_DIR + '/utility_files'
```

Bootstrap Environment

In [2]:
```python
#add in support for utility file directory and importing
import sys
import os

if ENABLE_COLAB:
  #Need access to drive
  from google.colab import drive
  drive.mount(GOOGLE_DRIVE_MOUNT, force_remount=True)

  #add in utility directory to syspath to import
  INIT_DIR = COLAB_INIT_DIR
  sys.path.append(os.path.abspath(INIT_DIR))

  #Config environment variables
  ROOT_DIR = COLAB_ROOT_DIR

else:
  #add in utility directory to syspath to import
  INIT_DIR = LOCAL_INIT_DIR
  sys.path.append(os.path.abspath(INIT_DIR))

  #Config environment variables
  ROOT_DIR = LOCAL_ROOT_DIR

#Import Utility Support
from jarvis import Jarvis
jarvis = Jarvis(ROOT_DIR, PROJECT_NAME)

import mv_python_utils as mvutils
```

```
Wha...where am I?
I am awake now.
```

I have set your current working directory to /home/magni/ML_Root/project_root
/ML1010-Group-Project
The current time is 12:13
Hello sir. Extra caffeine may help.

Setup Runtime Environment

In [3]:
```python
if ENABLE_COLAB:
  #!pip install scipy -q
  #!pip install scikit-learn -q
  #!pip install pycaret -q
  #!pip install matplotlib -q
  #!pip install joblib -q
  #!pip install pandasql -q
  !pip install umap_learn -q
  !pip install sentence_transformers -q
  !pip install spacytextblob -q
  !pip install flair -q
  display('Google Colab enabled')
else:
  display('Google Colab not enabled')

#Common imports
import json
import pandas as pd
import numpy as np
import matplotlib
import re
import nltk
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn import metrics
from sklearn.datasets import load_digits
from sklearn.model_selection import train_test_split as tts
#from yellowbrick.classifier import ConfusionMatrix
#from sklearn.linear_model import LogisticRegression
from yellowbrick.target import ClassBalance
from xgboost import XGBClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, confusion_matrix
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier


nltk.download('stopwords')
%matplotlib inline
```

'Google Colab not enabled'

[nltk_data] Downloading package stopwords to /home/magni/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!

In [4]:
```python
import importlib
import cw_df_metric_utils as cwutils
import DataPackage as dp
import DataPackageSupport as dps
import DataExperiment
import DataExperimentSupport
```

```
2022-01-25 12:13:37.521615: W tensorflow/stream_executor/platform/default/dso
_loader.cc:64] Could not load dynamic library 'libcudart.so.11.0'; dlerror: l
ibcudart.so.11.0: cannot open shared object file: No such file or directory
2022-01-25 12:13:37.521634: I tensorflow/stream_executor/cuda/cudart_stub.cc:
29] Ignore above cudart dlerror if you do not have a GPU set up on your machi
ne.
```

In [5]:
```python
importlib.reload(dp)
importlib.reload(dps)
importlib.reload(DataExperiment)
importlib.reload(DataExperimentSupport)
```

Out[5]:
```
<module 'DataExperimentSupport' from '/home/magni/ML_Root/project_root/utilit
y_files/DataExperimentSupport.py'>
```

Load Data

In [6]:
```python
#axis_labels=[1,2,3,4,5]
axis_labels=[0,1]
#classifier = RandomForestClassifier()
#classifier = XGBClassifier(eval_metric='mlogloss')
classifier = XGBClassifier(silent=False,
                           scale_pos_weight=1,
                           learning_rate=0.01,
                           colsample_bytree = 0.4,
                           subsample = 0.8,
                           objective='binary:logistic',
                           n_estimators=1000,
                           reg_alpha = 0.3,
                           max_depth=4,
                           gamma=10,
                           eval_metric='mlogloss')
ANALSYSIS_COL = 'reviewText_lemma_bert'
UNIQUE_COL = 'uuid'
TARGET_COL = 'overall_posneg'
```

In [7]:
```python
if LOAD_FROM_EXP:
    #start from saved state
    myExp = jarvis.loadExperiment(FILE_NAME)
    myExp.display()

else:
    #start from source file and regenerate
    testDf = pd.read_pickle(jarvis.DATA_DIR_WORK + "/01_NL_ReviewText_All(new

    testDfBert = cwutils.getBertEncodeFrame(df=testDf,
                                            bertColumn=ANALSYSIS_COL,
                                            uniqueColumn=UNIQUE_COL,
                                            otherColumns=[TARGET_COL]
                                            )



    myExp = DataExperiment.DataExperiment(projectName=PROJECT_NAME,
                                          experimentName=EXPERIMENT_NAME,
                                          origData=testDfBert,
                                          uniqueColumn=UNIQUE_COL,
                                          targetColumn=TARGET_COL,
                                          classifier=classifier)
```

```
DataExperiment summary:
---> projectName: ML1010-Group-Project
---> experimentName: ReviewText_Lemma_Bert2 (XGB_Tune)
---> isDataPackageLoaded: True
---> isBaseModelLoaded: False
---> isBaseModelPredicted: False
---> isBaseModelLearningCurveCreated: False
---> isFinalModelLoaded: False
---> isFinalModelPredicted: False
---> isFinalModelLearningCurveCreated: False
---> isClassifierLoaded: True
XGBClassifier(base_score=None, booster=None, colsample_bylevel=None,
              colsample_bynode=None, colsample_bytree=0.4,
              enable_categorical=False, eval_metric='mlogloss', gamma=10,
              gpu_id=None, importance_type=None, interaction_constraints=Non
e,
              learning_rate=0.01, max_delta_step=None, max_depth=4,
              min_child_weight=None, missing=nan, monotone_constraints=None,
              n_estimators=1000, n_jobs=None, num_parallel_tree=None,
              predictor=None, random_state=None, reg_alpha=0.3, reg_lambda=No
ne,
              scale_pos_weight=1, silent=False, subsample=0.8, tree_method=No
ne,
              validate_parameters=None, verbosity=None)

    DataPackage summary:
    Attributes:
    ---> uniqueColumn: uuid
    ---> targetColumn: overall_posneg
    Process:
    ---> isBalanced: False
    ---> isTrainTestSplit: False
    Data:
```

```
                   ---> isOrigDataLoaded: True
                   ---> isTrainDataLoaded: False
```

In [8]:
```
myExp.dataPackage.classBalanceUndersample()
myExp.dataPackage.splitTrainTest()
```

Class Balance for 63,413 Instances


```
Undersampling data to match min class: 0 of size: 13440
```

Class Balance for 26,880 Instances

	overall_posneg	ttlCol
0	0	13440
1	1	13440

```
Completed train/test split (train_size = 0.8):
---> Original data size: 26880
---> Training data size: 21504
---> Testing data size: 5376
---> Stratified on column: overall_posneg
```

In [9]:
```
%%time
myExp.createBaseModel()
```

```
[12:13:46] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.
```

```
    This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
Base Model Stats:
Accuracy: 0.8
Precision: 0.8
Recalll: 0.8
F1 Score: 0.8
Cohen kappa:: 0.61
CPU times: user 10min 43s, sys: 202 ms, total: 10min 44s
Wall time: 41.2 s
```
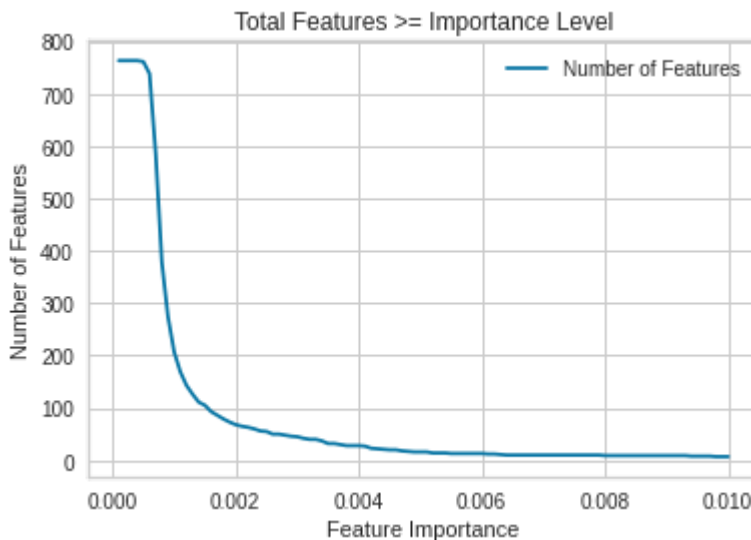
In [10]:
```python
_ = myExp.analyzeBaseModelFeatureImportance(returnAbove=0.001)
```

```
  0%|          | 0/101 [00:00<?, ?it/s]
Feature Importance Summary:
---> Original feature count: 768
---> Returned feature count: 207
---> Removed feature count: 561
---> Return items above (including): 0.001
```


In [11]:
```python
%%time
myExp.createFinalModel(featureImportanceThreshold=0.001)
```

```
  0%|          | 0/101 [00:00<?, ?it/s]
  0%|          | 0/101 [00:00<?, ?it/s]
[12:14:28] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.
```

```
      This could be a false alarm, with some parameters getting used by language
   bindings but
      then being mistakenly passed down to XGBoost core, or some parameter actual
   ly being used
      but getting flagged wrongly here. Please open an issue if you find any such
   cases.



   /home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
   arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
   ated and will be removed in a future release. To remove this warning, do the
   following: 1) Pass option use_label_encoder=False when constructing XGBClassi
   fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
   0, 1, 2, ..., [num_class - 1].
      warnings.warn(label_encoder_deprecation_msg, UserWarning)
   Final Model Stats:
   Accuracy: 0.8
   Precision: 0.8
   Recalll: 0.8
   F1 Score: 0.8
   Cohen kappa:: 0.6
   CPU times: user 3min 11s, sys: 116 ms, total: 3min 11s
   Wall time: 12.3 s
```

In [12]:
```python
%%time
myExp.createBaseModelLearningCurve()
```

```
[learning_curve] Training set sizes: [ 1720  3440  8601 17203]
[12:14:40] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

   This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.



[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worke
rs.
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
   warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.888, test=0.780) total time=
4.9s
[12:14:45] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

   This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
```

```
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Done    1 out of    1 | elapsed:    4.9s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.875, test=0.790) total time=
7.8s
[12:14:53] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Done    2 out of    2 | elapsed:   12.8s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.864, test=0.798) total time=  1
9.6s
[12:15:13] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Done    3 out of    3 | elapsed:   32.4s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.849, test=0.804) total time=  3
```

1.9s
[12:15:44] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.882, test=0.787) total time=
4.5s
[12:15:49] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.869, test=0.792) total time=
7.5s
[12:15:56] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].

```
   warnings.warn(label encoder deprecation msg, UserWarning)
[CV] END ...................., score=(train=0.862, test=0.797) total time=  1
6.8s
[12:16:13] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.849, test=0.805) total time=  3
1.4s
[12:16:45] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.888, test=0.803) total time=
4.5s
[12:16:49] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
```

```
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.876, test=0.809) total time=
7.5s
[12:16:57] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.861, test=0.816) total time=  1
6.8s
[12:17:14] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.848, test=0.817) total time=  3
2.1s
[12:17:46] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
```

```
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.892, test=0.785) total time=
4.8s
[12:17:51] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.877, test=0.790) total time=
7.9s
[12:17:59] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.862, test=0.796) total time=  1
7.4s
[12:18:16] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.
```

```
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.847, test=0.805) total time=  3
1.6s
[12:18:48] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.883, test=0.792) total time=
4.9s
[12:18:53] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.872, test=0.798) total time=
8.1s
[12:19:01] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.
```

```
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ..................., score=(train=0.863, test=0.805) total time=  1
7.4s
[12:19:18] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ..................., score=(train=0.844, test=0.810) total time=  3
4.1s
CPU times: user 1h 21min 42s, sys: 1.47 s, total: 1h 21min 43s
Wall time: 5min 12s
```

In [13]:
```
%%time
myExp.createFinalModelLearningCurve()
```

```
[learning_curve] Training set sizes: [ 1720  3440  8601 17203]
[12:19:52] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worke
rs.
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
```

```
    warnings warn(label encoder deprecation msg UserWarning)
[CV] END ...................., score=(train=0.867, test=0.779) total time=
2.6s
[12:19:55] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

   This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    2.6s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.859, test=0.790) total time=
3.1s
[12:19:58] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

   This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.


[Parallel(n_jobs=1)]: Done   2 out of   2 | elapsed:    5.7s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.842, test=0.799) total time=
5.5s
[12:20:04] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

   This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.
```

```
[Parallel(n_jobs=1)]: Done   3 out of   3 | elapsed:   11.3s remaining:    0.
0s
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.837, test=0.800) total time=  1
1.0s
[12:20:15] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.858, test=0.789) total time=
2.1s
[12:20:17] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.849, test=0.789) total time=
2.9s
[12:20:20] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
```

but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.845, test=0.794) total time=
5.2s
[12:20:25] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.837, test=0.804) total time=
9.5s
[12:20:34] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.865, test=0.802) total time=
2.1s
[12:20:36] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but

```
    then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.853, test=0.807) total time=
2.8s
[12:20:39] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.839, test=0.810) total time=
5.6s
[12:20:45] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
   then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
   but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.833, test=0.812) total time=  1
0.0s
[12:20:55] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.
```

```
  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.874, test=0.786) total time=
2.3s
[12:20:57] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.856, test=0.788) total time=
3.0s
[12:21:00] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.844, test=0.794) total time=
5.4s
[12:21:05] WARNING: ../src/learner.cc:576:
```

Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.834, test=0.797) total time=
9.8s
[12:21:15] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.862, test=0.790) total time=
2.0s
[12:21:17] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...., score=(train=0.849, test=0.799) total time=

```
2.9s
[12:21:20] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.845, test=0.806) total time=
5.3s
[12:21:26] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[CV] END ...................., score=(train=0.834, test=0.811) total time=
9.8s
CPU times: user 26min 46s, sys: 417 ms, total: 26min 47s
Wall time: 1min 43s
```

In [14]:
```python
%%time
myExp.showBaseModelReport(axis_labels,
                          upperValue=0.025)
```

```
Base Model Stats:
Accuracy: 0.8
Precision: 0.8
Recalll: 0.8
F1 Score: 0.8
Cohen kappa:: 0.61
              precision    recall  f1-score   support

           0       0.80      0.82      0.81      2688
           1       0.81      0.79      0.80      2688
```

```
        accuracy                              0.80      5376
       macro avg        0.80      0.80        0.80      5376
    weighted avg        0.80      0.80        0.80      5376
```

Confusion Matrix: ReviewText_Lemma_Bert2 (XGB_Tune)

Precision-Recall Curve for XGBClassifier


```
<Figure size 576x576 with 0 Axes>
```
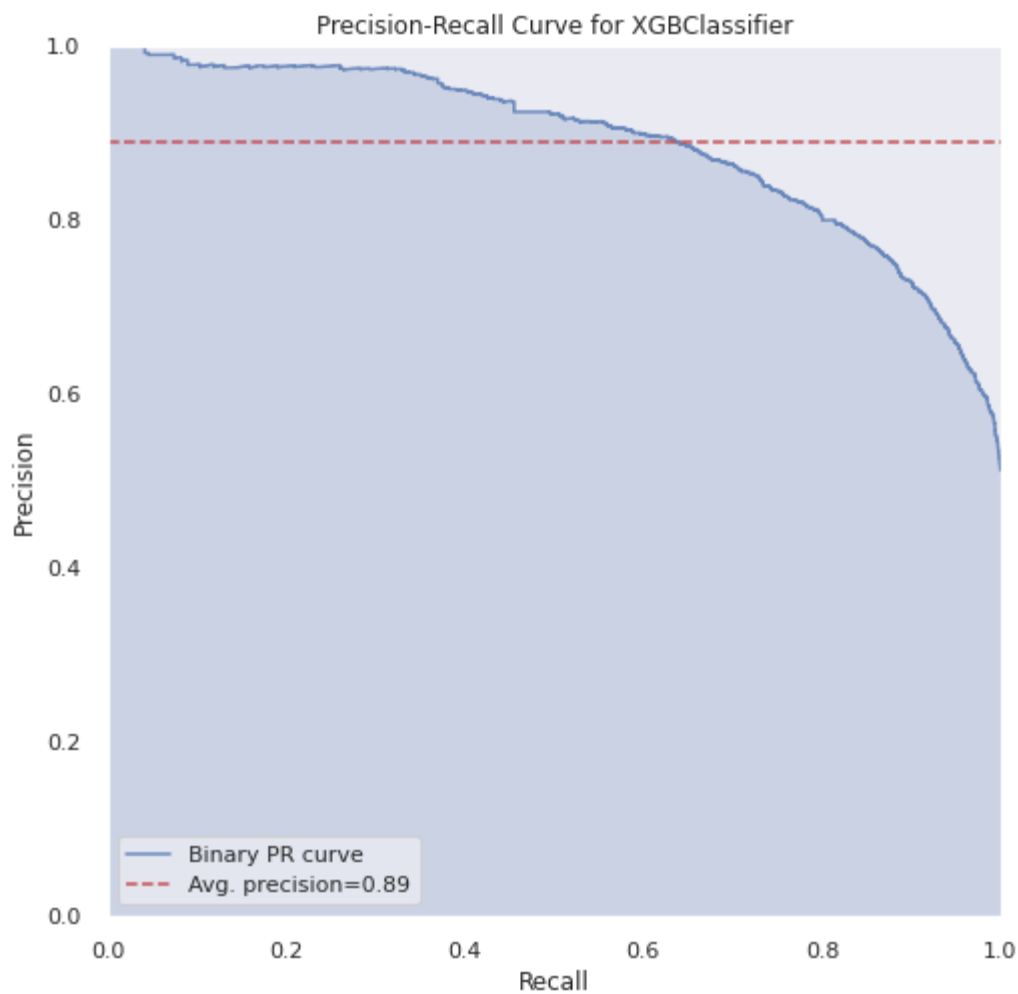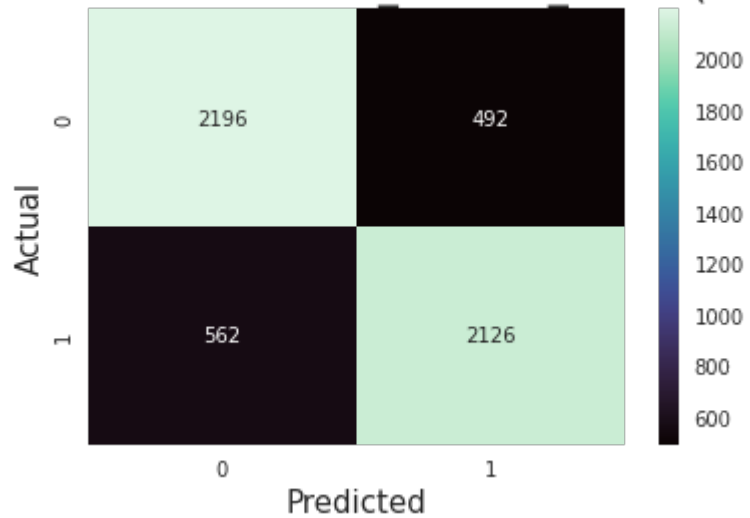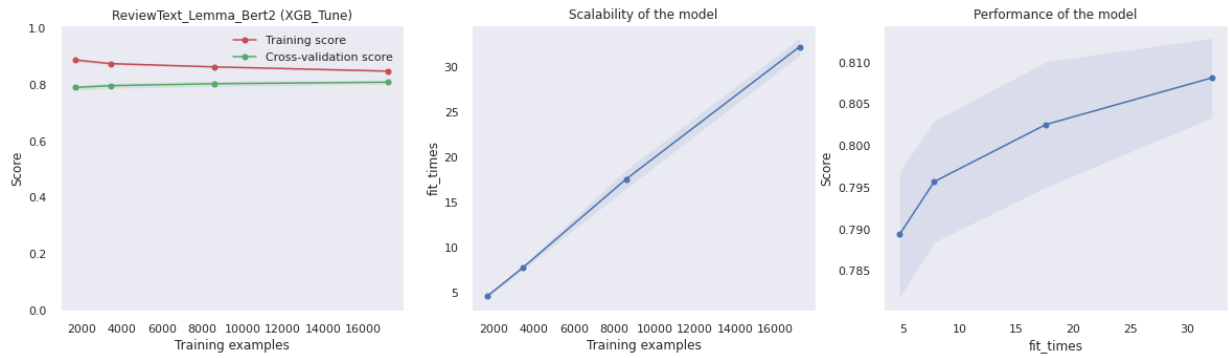
Base model ROCAUC not calculated. Starting now
[12:21:36] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.

/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)

ROC Curves for XGBClassifier

0%| | 0/251 [00:00<?, ?it/s]

Total Features >= Importance Level

Model Feature Importance (top 25)

Feature Importances of Top 5 Features using XGBClassifier

In [15]:
```
%%time
myExp
myExp.showFinalModelReport(axis_labels,
                           startValue=0,
                           increment=0.001,
                           upperValue=0.02)
```

```
Final Model Stats:
Accuracy: 0.8
Precision: 0.8
Recalll: 0.8
F1 Score: 0.8
Cohen kappa:: 0.6
              precision    recall  f1-score   support

           0       0.79      0.82      0.80      2688
           1       0.81      0.79      0.80      2688

    accuracy                           0.80      5376
   macro avg       0.80      0.80      0.80      5376
weighted avg       0.80      0.80      0.80      5376
```

Confusion Matrix: ReviewText_Lemma_Bert2 (XGB_Tune)

Precision-Recall Curve for XGBClassifier

```
<Figure size 576x576 with 0 Axes>
```
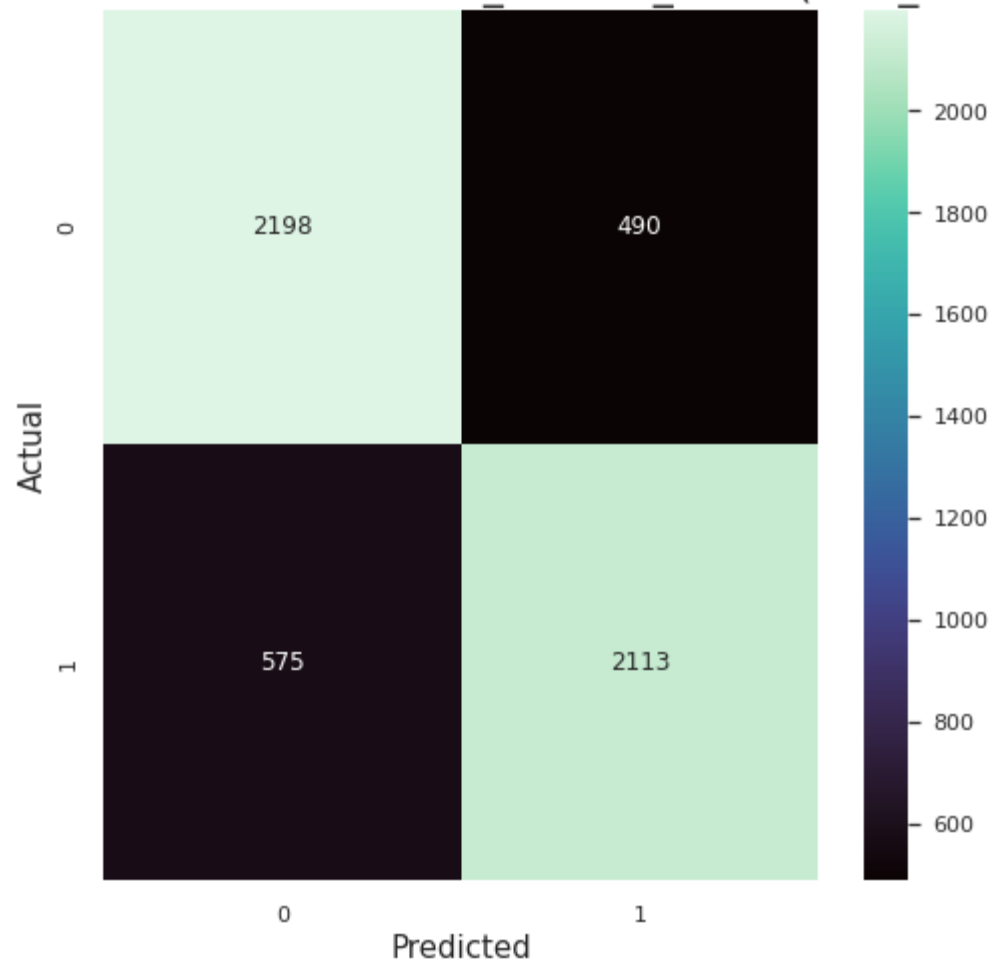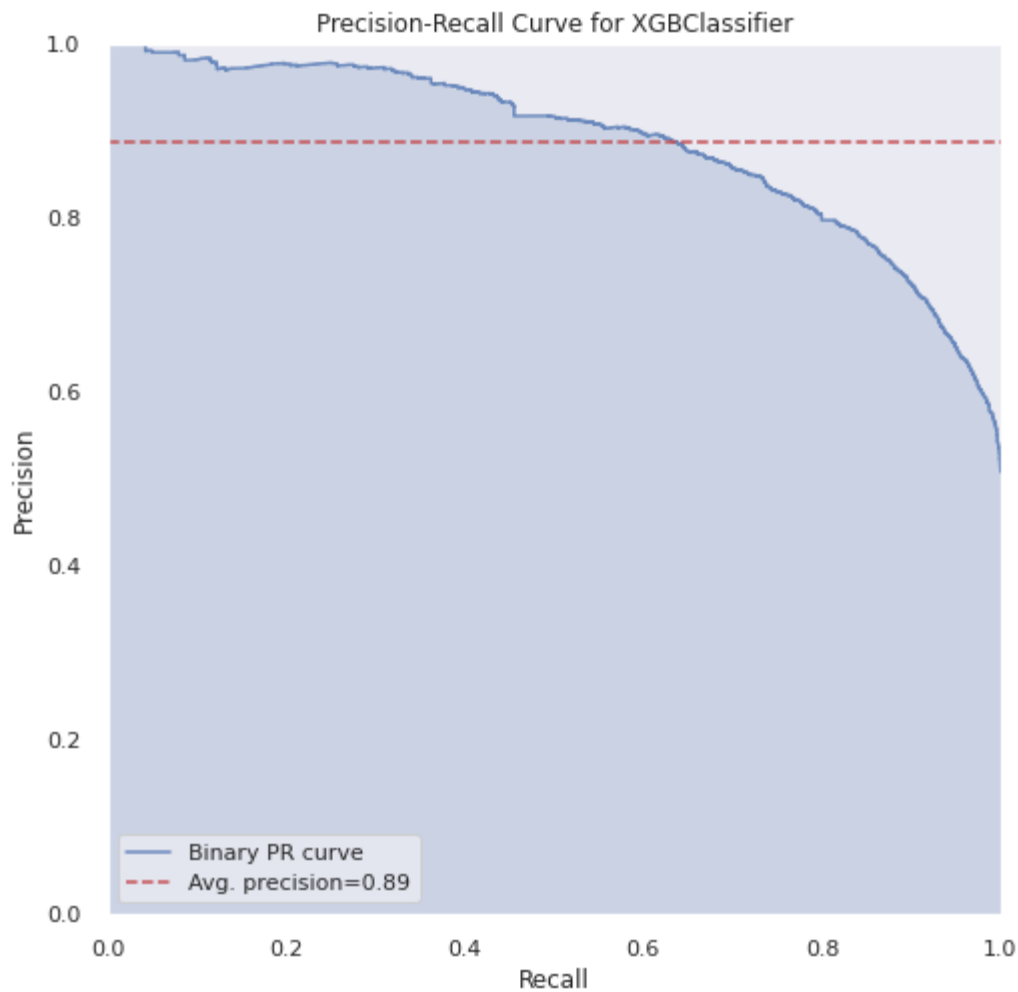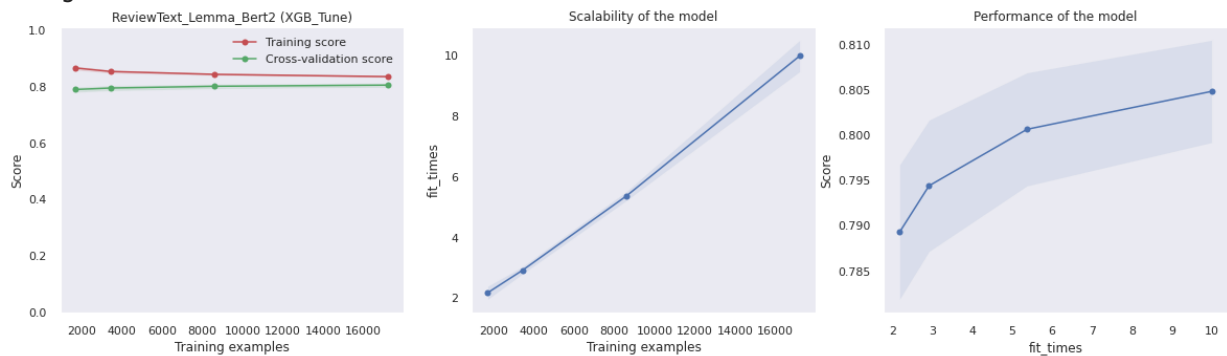


```
Final model ROCAUC not calculated. Starting now
[12:25:28] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
```
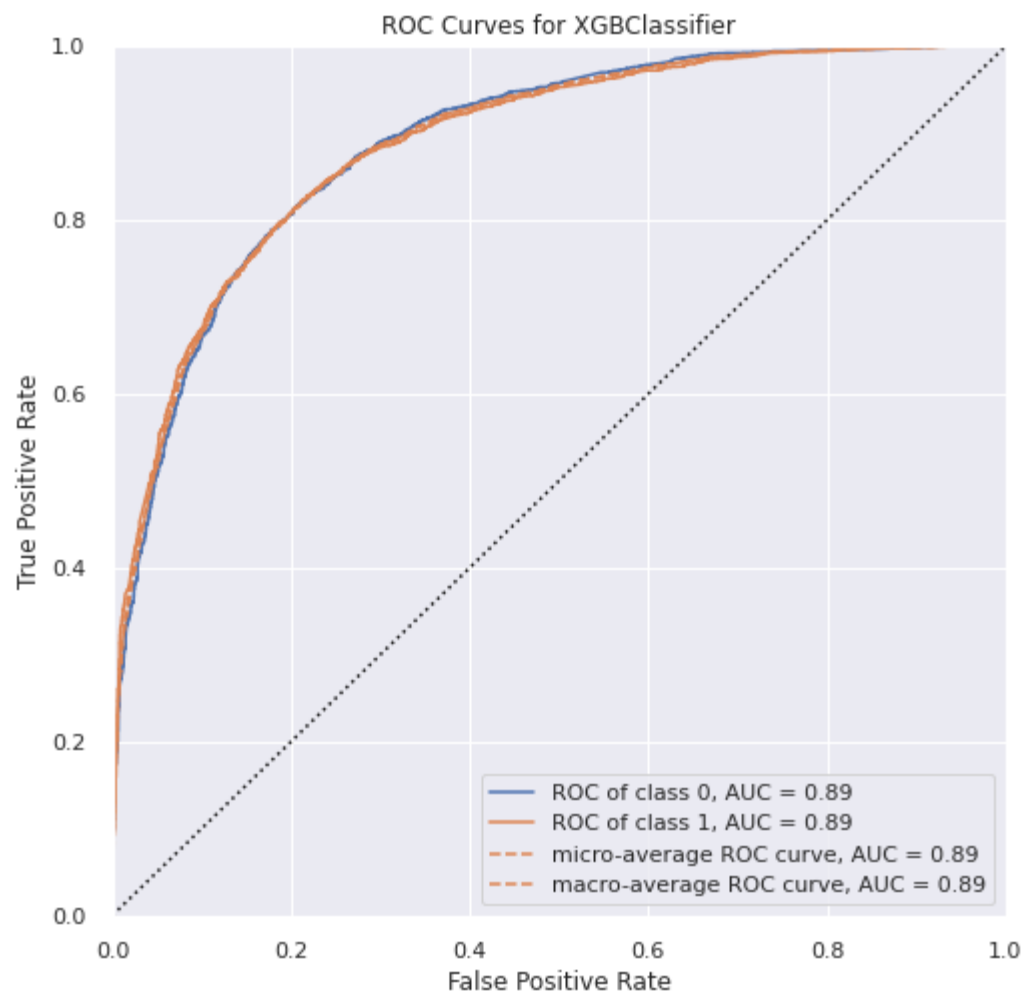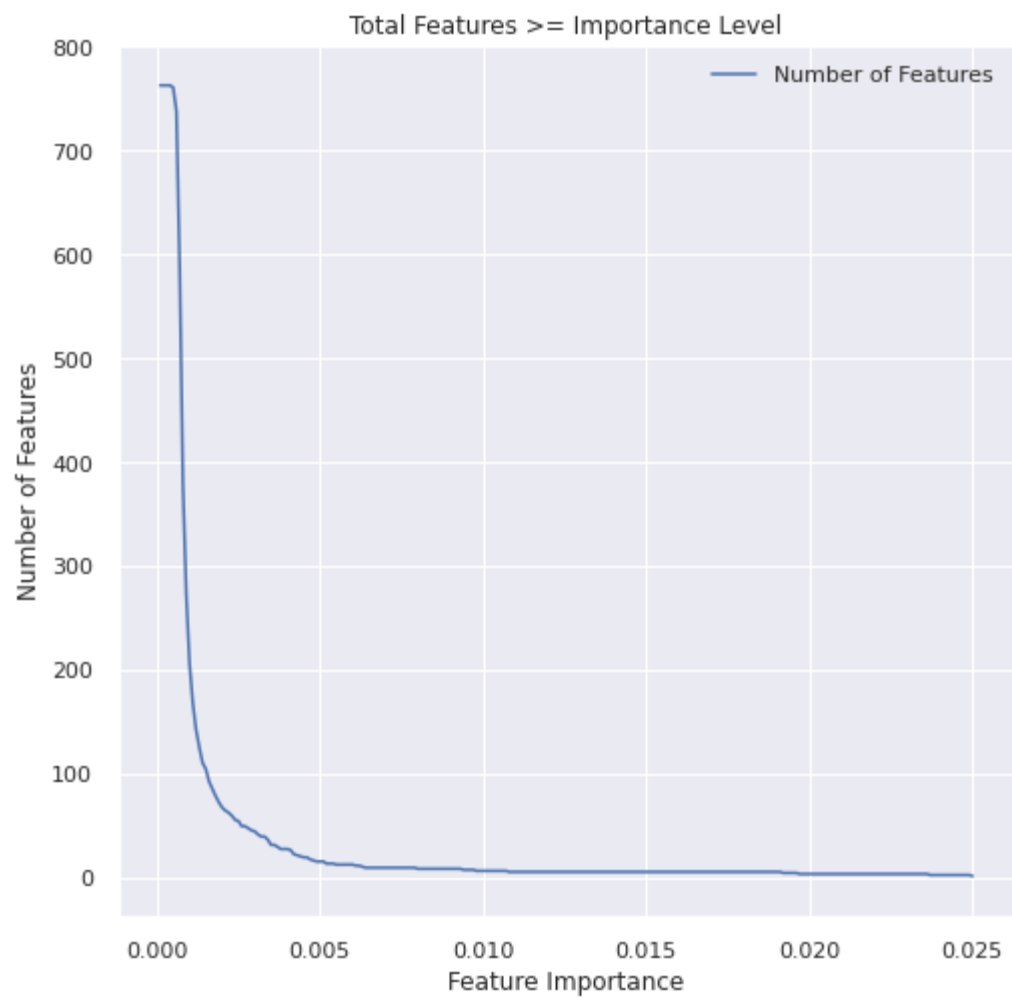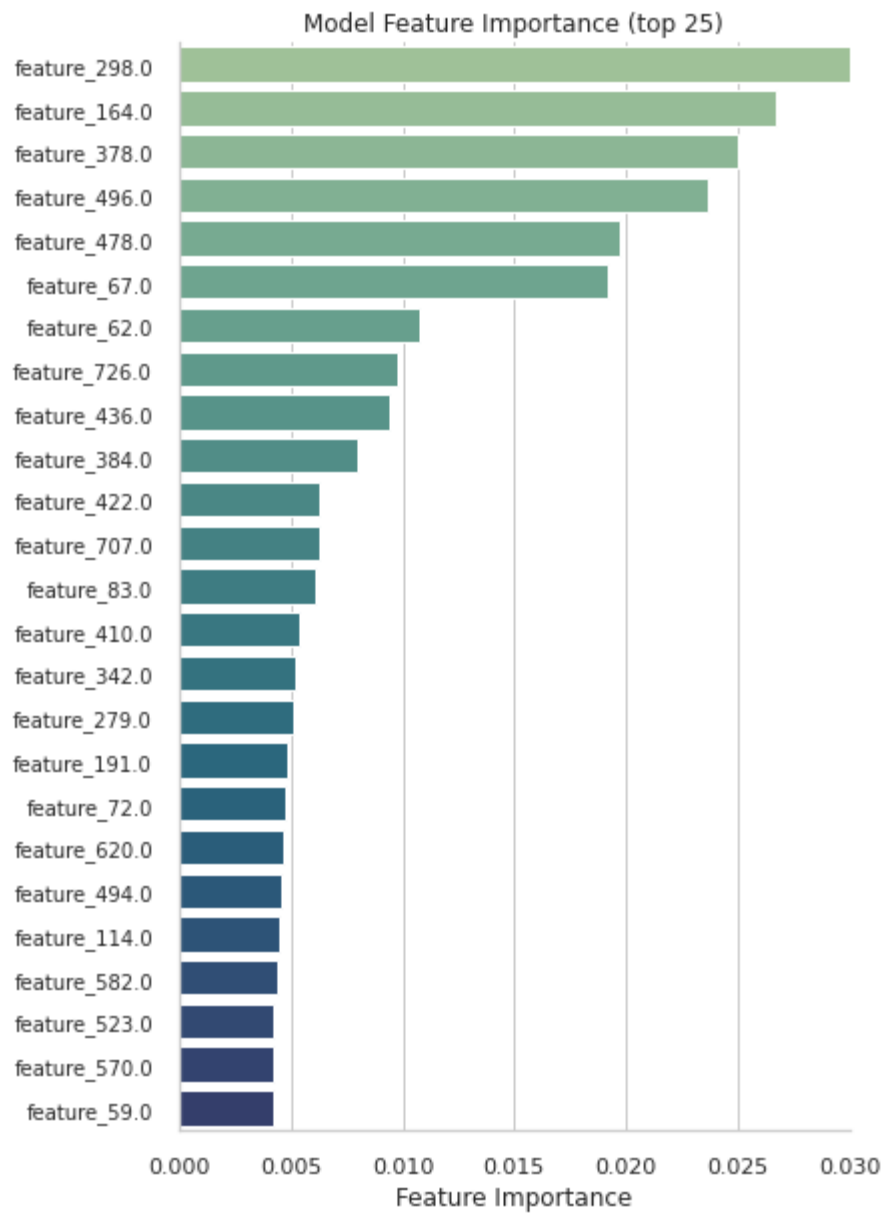
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
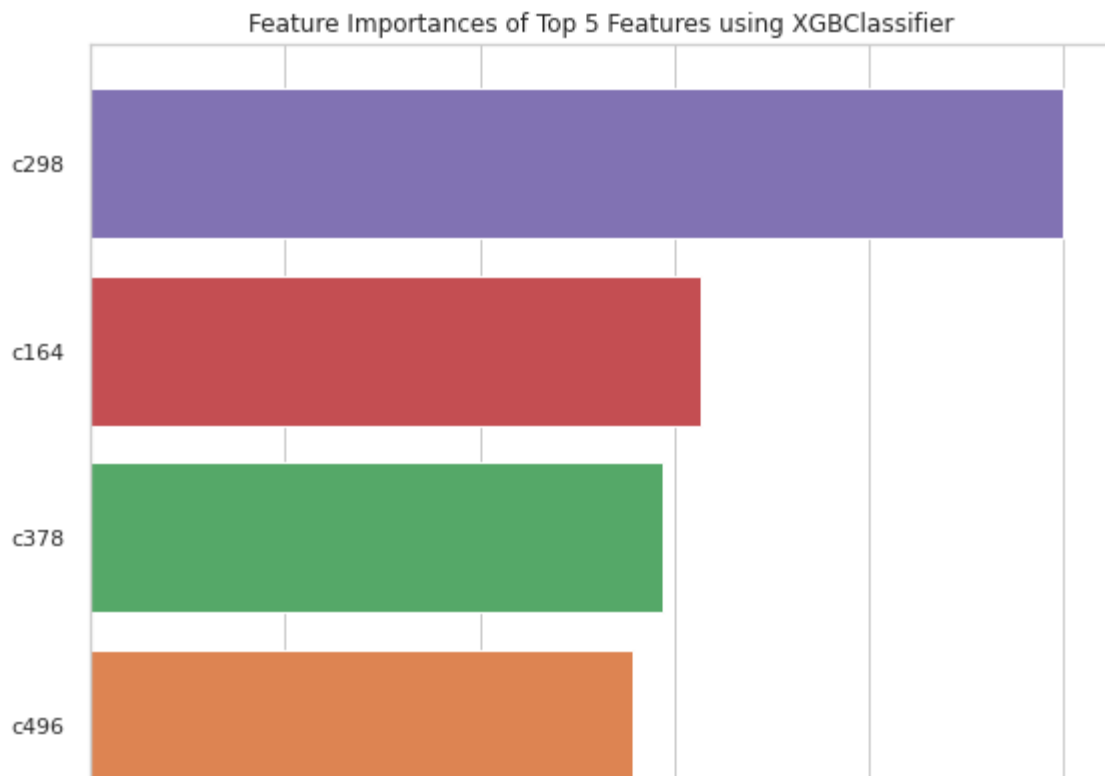0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)

0%| | 0/22 [00:00<?, ?it/s]

Total Features >= Importance Level

Model Feature Importance (top 25)

Feature Importances of Top 5 Features using XGBClassifier

In [16]:
```
myExp.display()
```

DataExperiment summary:
---> projectName: ML1010-Group-Project
---> experimentName: ReviewText_Lemma_Bert2 (XGB_Tune)
---> isDataPackageLoaded: True
---> isBaseModelLoaded: True
---> isBaseModelPredicted: True
---> isBaseModelLearningCurveCreated: True
---> isFinalModelLoaded: True
---> isFinalModelPredicted: True
---> isFinalModelLearningCurveCreated: True
---> isClassifierLoaded: True
XGBClassifier(base_score=None, booster=None, colsample_bylevel=None,
              colsample_bynode=None, colsample_bytree=0.4,
              enable_categorical=False, eval_metric='mlogloss', gamma=10,
              gpu_id=None, importance_type=None, interaction_constraints=Non
e,
              learning_rate=0.01, max_delta_step=None, max_depth=4,
              min_child_weight=None, missing=nan, monotone_constraints=None,
              n_estimators=1000, n_jobs=None, num_parallel_tree=None,
              predictor=None, random_state=None, reg_alpha=0.3, reg_lambda=No
ne,
              scale_pos_weight=1, silent=False, subsample=0.8, tree_method=No
ne,
              validate_parameters=None, verbosity=None)

    DataPackage summary:
    Attributes:
    ---> uniqueColumn: uuid
    ---> targetColumn: overall_posneg
    Process:
    ---> isBalanced: True
    ---> isTrainTestSplit: True
    Data:

```
---> isOrigDataLoaded: False
---> isTrainDataLoaded: True
```

Save Experiment

In [17]:
```python
jarvis.saveExperiment(myExp, FILE_NAME)
```

Scratchpad

In [20]:
```python
model = myExp.getClassifier()
# define the datasets to evaluate each iteration
X_train=myExp.dataPackage.getXTrainData()
Y_train=myExp.dataPackage.getYTrainData()
X_test=myExp.dataPackage.getXTestData()
Y_test=myExp.dataPackage.getYTestData()
evalset = [(X_train, Y_train), (X_test,Y_test)]
# fit the model
model.fit(X_train, Y_train, eval_metric='logloss', eval_set=evalset)
# evaluate performance
yhat = model.predict(X_test)
score = accuracy_score(Y_test, yhat)
print('Accuracy: %.3f' % score)
# retrieve performance metrics
results = model.evals_result()
# plot learning curves
plt.plot(results['validation_0']['logloss'], label='train')
plt.plot(results['validation_1']['logloss'], label='test')
# show the legend
plt.legend()
# show the plot
```

```
/home/magni/python_env/ML1010_env2/lib64/python3.7/site-packages/xgboost/skle
arn.py:1224: UserWarning: The use of label encoder in XGBClassifier is deprec
ated and will be removed in a future release. To remove this warning, do the
following: 1) Pass option use_label_encoder=False when constructing XGBClassi
fier object; and 2) Encode your labels (y) as integers starting with 0, i.e.
0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)
[14:10:46] WARNING: ../src/learner.cc:576:
Parameters: { "silent" } might not be used.

  This could be a false alarm, with some parameters getting used by language
bindings but
  then being mistakenly passed down to XGBoost core, or some parameter actual
ly being used
  but getting flagged wrongly here. Please open an issue if you find any such
cases.


[0]     validation_0-logloss:0.68960    validation_1-logloss:0.68972
[1]     validation_0-logloss:0.68609    validation_1-logloss:0.68634
[2]     validation_0-logloss:0.68259    validation_1-logloss:0.68292
[3]     validation_0-logloss:0.67908    validation_1-logloss:0.67955
```
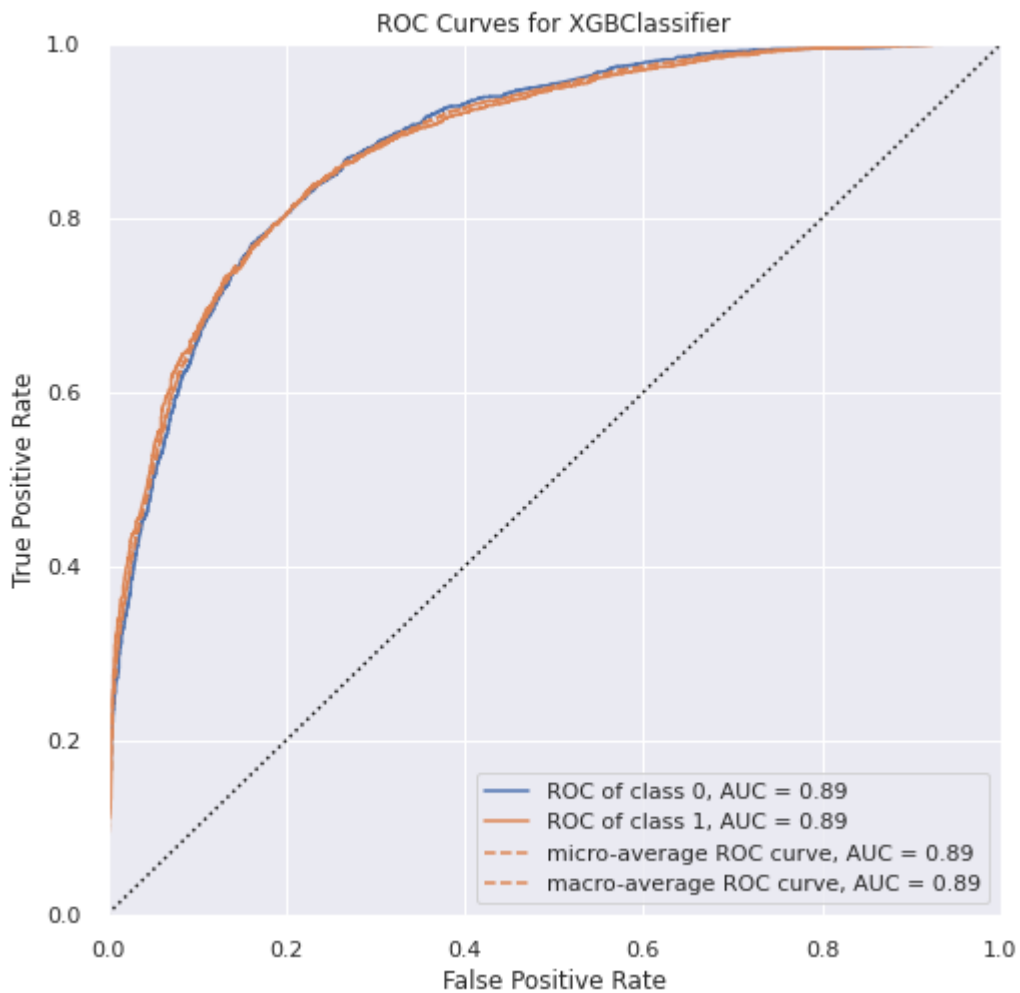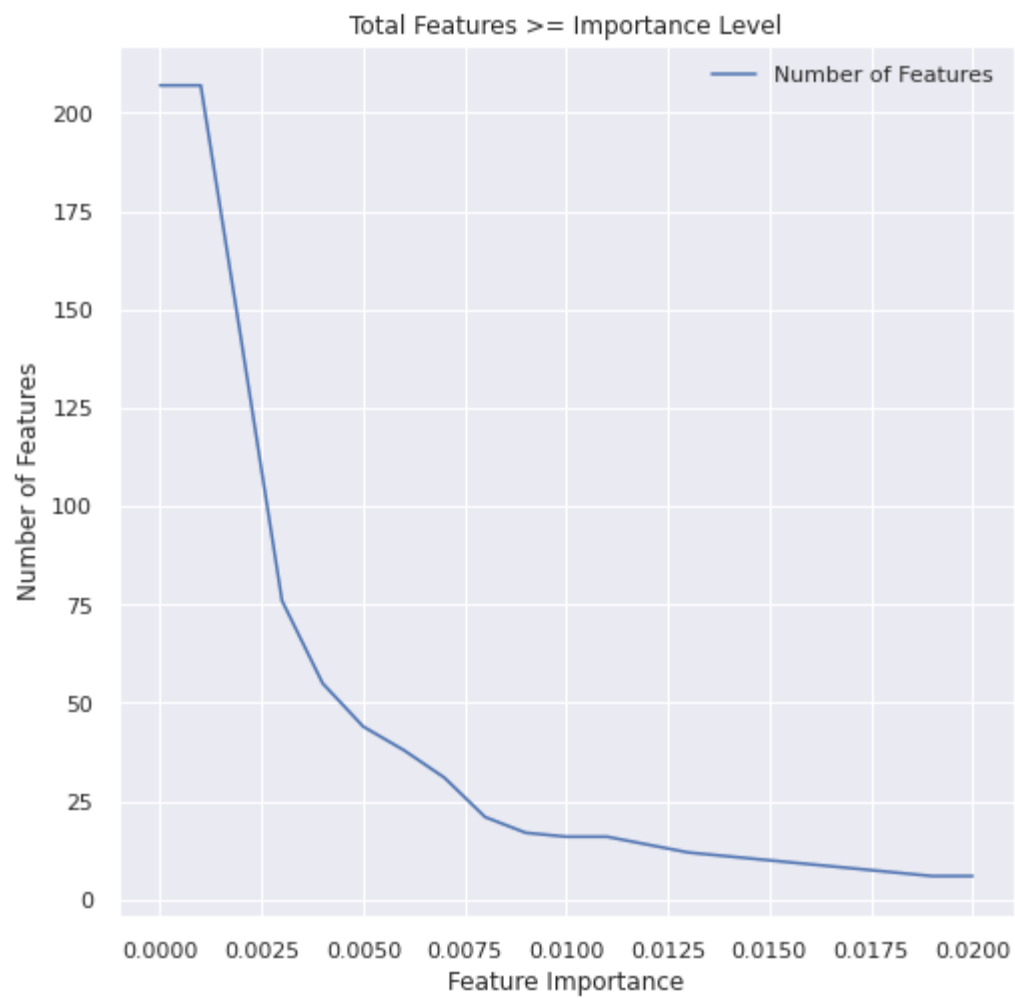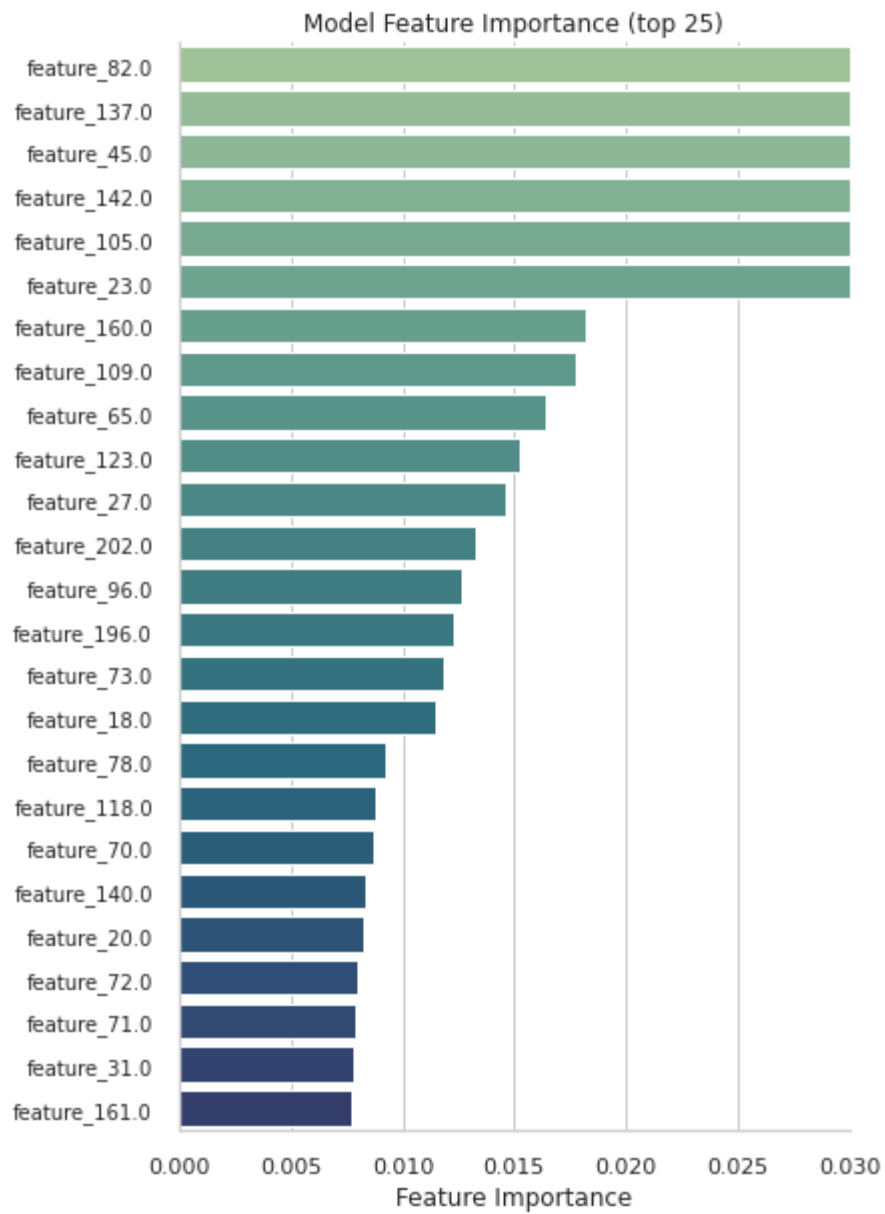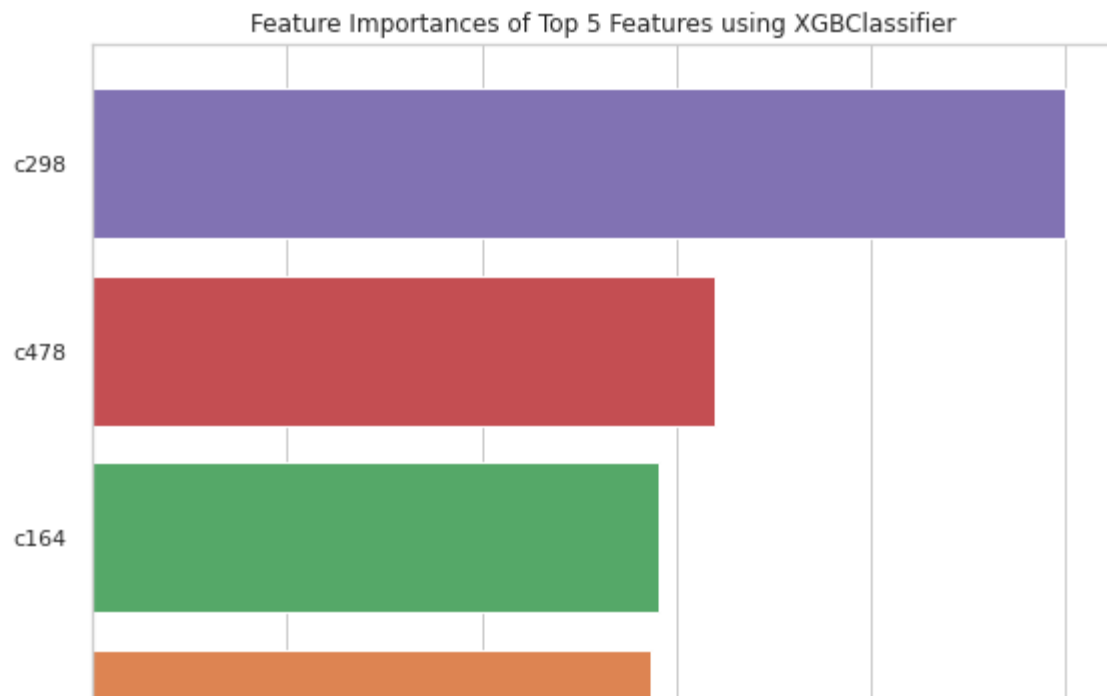
```
[4]     validation_0-logloss:0.67576    validation_1-logloss:0.67633
[5]     validation_0-logloss:0.67243    validation_1-logloss:0.67310
[6]     validation_0-logloss:0.66921    validation_1-logloss:0.66997
[7]     validation_0-logloss:0.66590    validation_1-logloss:0.66681
[8]     validation_0-logloss:0.66274    validation_1-logloss:0.66381
[9]     validation_0-logloss:0.65970    validation_1-logloss:0.66088
[10]    validation_0-logloss:0.65670    validation_1-logloss:0.65795
[11]    validation_0-logloss:0.65373    validation_1-logloss:0.65511
[12]    validation_0-logloss:0.65076    validation_1-logloss:0.65222
[13]    validation_0-logloss:0.64787    validation_1-logloss:0.64948
[14]    validation_0-logloss:0.64494    validation_1-logloss:0.64671
[15]    validation_0-logloss:0.64204    validation_1-logloss:0.64392
[16]    validation_0-logloss:0.63935    validation_1-logloss:0.64126
[17]    validation_0-logloss:0.63655    validation_1-logloss:0.63858
[18]    validation_0-logloss:0.63384    validation_1-logloss:0.63602
[19]    validation_0-logloss:0.63111    validation_1-logloss:0.63345
[20]    validation_0-logloss:0.62846    validation_1-logloss:0.63091
[21]    validation_0-logloss:0.62589    validation_1-logloss:0.62846
[22]    validation_0-logloss:0.62337    validation_1-logloss:0.62603
[23]    validation_0-logloss:0.62090    validation_1-logloss:0.62366
[24]    validation_0-logloss:0.61843    validation_1-logloss:0.62129
[25]    validation_0-logloss:0.61607    validation_1-logloss:0.61898
[26]    validation_0-logloss:0.61373    validation_1-logloss:0.61669
[27]    validation_0-logloss:0.61138    validation_1-logloss:0.61445
[28]    validation_0-logloss:0.60907    validation_1-logloss:0.61222
[29]    validation_0-logloss:0.60675    validation_1-logloss:0.61000
[30]    validation_0-logloss:0.60448    validation_1-logloss:0.60783
[31]    validation_0-logloss:0.60224    validation_1-logloss:0.60565
[32]    validation_0-logloss:0.60000    validation_1-logloss:0.60351
[33]    validation_0-logloss:0.59783    validation_1-logloss:0.60149
[34]    validation_0-logloss:0.59567    validation_1-logloss:0.59939
[35]    validation_0-logloss:0.59357    validation_1-logloss:0.59744
[36]    validation_0-logloss:0.59150    validation_1-logloss:0.59546
[37]    validation_0-logloss:0.58945    validation_1-logloss:0.59354
[38]    validation_0-logloss:0.58741    validation_1-logloss:0.59160
[39]    validation_0-logloss:0.58540    validation_1-logloss:0.58971
[40]    validation_0-logloss:0.58341    validation_1-logloss:0.58785
[41]    validation_0-logloss:0.58146    validation_1-logloss:0.58599
[42]    validation_0-logloss:0.57956    validation_1-logloss:0.58414
[43]    validation_0-logloss:0.57761    validation_1-logloss:0.58228
[44]    validation_0-logloss:0.57573    validation_1-logloss:0.58048
[45]    validation_0-logloss:0.57388    validation_1-logloss:0.57873
[46]    validation_0-logloss:0.57206    validation_1-logloss:0.57700
[47]    validation_0-logloss:0.57027    validation_1-logloss:0.57525
[48]    validation_0-logloss:0.56849    validation_1-logloss:0.57354
[49]    validation_0-logloss:0.56677    validation_1-logloss:0.57188
[50]    validation_0-logloss:0.56502    validation_1-logloss:0.57021
[51]    validation_0-logloss:0.56333    validation_1-logloss:0.56856
[52]    validation_0-logloss:0.56165    validation_1-logloss:0.56697
[53]    validation_0-logloss:0.56002    validation_1-logloss:0.56546
[54]    validation_0-logloss:0.55839    validation_1-logloss:0.56393
[55]    validation_0-logloss:0.55680    validation_1-logloss:0.56242
[56]    validation_0-logloss:0.55520    validation_1-logloss:0.56091
[57]    validation_0-logloss:0.55363    validation_1-logloss:0.55946
[58]    validation_0-logloss:0.55208    validation_1-logloss:0.55796
[59]    validation_0-logloss:0.55058    validation_1-logloss:0.55659
[60]    validation_0-logloss:0.54903    validation_1-logloss:0.55514
[61]    validation_0-logloss:0.54755    validation_1-logloss:0.55375
[62]    validation_0-logloss:0.54609    validation_1-logloss:0.55233
```

```
[63]     validation_0-logloss:0.54466    validation_1-logloss:0.55095
[64]     validation_0-logloss:0.54322    validation_1-logloss:0.54958
[65]     validation_0-logloss:0.54178    validation_1-logloss:0.54822
[66]     validation_0-logloss:0.54040    validation_1-logloss:0.54693
[67]     validation_0-logloss:0.53900    validation_1-logloss:0.54564
[68]     validation_0-logloss:0.53765    validation_1-logloss:0.54431
[69]     validation_0-logloss:0.53631    validation_1-logloss:0.54305
[70]     validation_0-logloss:0.53499    validation_1-logloss:0.54184
[71]     validation_0-logloss:0.53369    validation_1-logloss:0.54061
[72]     validation_0-logloss:0.53239    validation_1-logloss:0.53941
[73]     validation_0-logloss:0.53108    validation_1-logloss:0.53820
[74]     validation_0-logloss:0.52982    validation_1-logloss:0.53699
[75]     validation_0-logloss:0.52860    validation_1-logloss:0.53586
[76]     validation_0-logloss:0.52735    validation_1-logloss:0.53468
[77]     validation_0-logloss:0.52614    validation_1-logloss:0.53354
[78]     validation_0-logloss:0.52494    validation_1-logloss:0.53244
[79]     validation_0-logloss:0.52375    validation_1-logloss:0.53136
[80]     validation_0-logloss:0.52255    validation_1-logloss:0.53026
[81]     validation_0-logloss:0.52137    validation_1-logloss:0.52918
[82]     validation_0-logloss:0.52022    validation_1-logloss:0.52815
[83]     validation_0-logloss:0.51910    validation_1-logloss:0.52713
[84]     validation_0-logloss:0.51795    validation_1-logloss:0.52608
[85]     validation_0-logloss:0.51689    validation_1-logloss:0.52509
[86]     validation_0-logloss:0.51576    validation_1-logloss:0.52407
[87]     validation_0-logloss:0.51467    validation_1-logloss:0.52309
[88]     validation_0-logloss:0.51359    validation_1-logloss:0.52210
[89]     validation_0-logloss:0.51255    validation_1-logloss:0.52112
[90]     validation_0-logloss:0.51150    validation_1-logloss:0.52015
[91]     validation_0-logloss:0.51050    validation_1-logloss:0.51919
[92]     validation_0-logloss:0.50943    validation_1-logloss:0.51822
[93]     validation_0-logloss:0.50843    validation_1-logloss:0.51732
[94]     validation_0-logloss:0.50742    validation_1-logloss:0.51635
[95]     validation_0-logloss:0.50642    validation_1-logloss:0.51540
[96]     validation_0-logloss:0.50546    validation_1-logloss:0.51450
[97]     validation_0-logloss:0.50450    validation_1-logloss:0.51362
[98]     validation_0-logloss:0.50355    validation_1-logloss:0.51274
[99]     validation_0-logloss:0.50258    validation_1-logloss:0.51187
[100]    validation_0-logloss:0.50165    validation_1-logloss:0.51100
[101]    validation_0-logloss:0.50070    validation_1-logloss:0.51013
[102]    validation_0-logloss:0.49981    validation_1-logloss:0.50928
[103]    validation_0-logloss:0.49891    validation_1-logloss:0.50847
[104]    validation_0-logloss:0.49802    validation_1-logloss:0.50766
[105]    validation_0-logloss:0.49716    validation_1-logloss:0.50687
[106]    validation_0-logloss:0.49626    validation_1-logloss:0.50606
[107]    validation_0-logloss:0.49541    validation_1-logloss:0.50530
[108]    validation_0-logloss:0.49456    validation_1-logloss:0.50450
[109]    validation_0-logloss:0.49371    validation_1-logloss:0.50371
[110]    validation_0-logloss:0.49289    validation_1-logloss:0.50297
[111]    validation_0-logloss:0.49206    validation_1-logloss:0.50221
[112]    validation_0-logloss:0.49122    validation_1-logloss:0.50143
[113]    validation_0-logloss:0.49040    validation_1-logloss:0.50073
[114]    validation_0-logloss:0.48961    validation_1-logloss:0.50001
[115]    validation_0-logloss:0.48880    validation_1-logloss:0.49932
[116]    validation_0-logloss:0.48800    validation_1-logloss:0.49862
[117]    validation_0-logloss:0.48722    validation_1-logloss:0.49793
[118]    validation_0-logloss:0.48649    validation_1-logloss:0.49729
[119]    validation_0-logloss:0.48575    validation_1-logloss:0.49664
[120]    validation_0-logloss:0.48499    validation_1-logloss:0.49595
[121]    validation_0-logloss:0.48422    validation_1-logloss:0.49527
```

```
[122]    validation_0-logloss:0.48350    validation_1-logloss:0.49461
[123]    validation_0-logloss:0.48283    validation_1-logloss:0.49403
[124]    validation_0-logloss:0.48211    validation_1-logloss:0.49337
[125]    validation_0-logloss:0.48140    validation_1-logloss:0.49271
[126]    validation_0-logloss:0.48069    validation_1-logloss:0.49205
[127]    validation_0-logloss:0.47997    validation_1-logloss:0.49139
[128]    validation_0-logloss:0.47929    validation_1-logloss:0.49078
[129]    validation_0-logloss:0.47860    validation_1-logloss:0.49016
[130]    validation_0-logloss:0.47793    validation_1-logloss:0.48958
[131]    validation_0-logloss:0.47728    validation_1-logloss:0.48898
[132]    validation_0-logloss:0.47660    validation_1-logloss:0.48839
[133]    validation_0-logloss:0.47596    validation_1-logloss:0.48787
[134]    validation_0-logloss:0.47531    validation_1-logloss:0.48731
[135]    validation_0-logloss:0.47467    validation_1-logloss:0.48672
[136]    validation_0-logloss:0.47405    validation_1-logloss:0.48620
[137]    validation_0-logloss:0.47342    validation_1-logloss:0.48564
[138]    validation_0-logloss:0.47277    validation_1-logloss:0.48509
[139]    validation_0-logloss:0.47218    validation_1-logloss:0.48457
[140]    validation_0-logloss:0.47159    validation_1-logloss:0.48407
[141]    validation_0-logloss:0.47098    validation_1-logloss:0.48356
[142]    validation_0-logloss:0.47037    validation_1-logloss:0.48300
[143]    validation_0-logloss:0.46979    validation_1-logloss:0.48248
[144]    validation_0-logloss:0.46920    validation_1-logloss:0.48195
[145]    validation_0-logloss:0.46865    validation_1-logloss:0.48151
[146]    validation_0-logloss:0.46806    validation_1-logloss:0.48099
[147]    validation_0-logloss:0.46746    validation_1-logloss:0.48046
[148]    validation_0-logloss:0.46689    validation_1-logloss:0.47997
[149]    validation_0-logloss:0.46633    validation_1-logloss:0.47949
[150]    validation_0-logloss:0.46576    validation_1-logloss:0.47897
[151]    validation_0-logloss:0.46523    validation_1-logloss:0.47851
[152]    validation_0-logloss:0.46470    validation_1-logloss:0.47804
[153]    validation_0-logloss:0.46414    validation_1-logloss:0.47755
[154]    validation_0-logloss:0.46363    validation_1-logloss:0.47710
[155]    validation_0-logloss:0.46307    validation_1-logloss:0.47659
[156]    validation_0-logloss:0.46257    validation_1-logloss:0.47615
[157]    validation_0-logloss:0.46208    validation_1-logloss:0.47573
[158]    validation_0-logloss:0.46156    validation_1-logloss:0.47530
[159]    validation_0-logloss:0.46106    validation_1-logloss:0.47487
[160]    validation_0-logloss:0.46055    validation_1-logloss:0.47442
[161]    validation_0-logloss:0.46008    validation_1-logloss:0.47400
[162]    validation_0-logloss:0.45959    validation_1-logloss:0.47361
[163]    validation_0-logloss:0.45908    validation_1-logloss:0.47321
[164]    validation_0-logloss:0.45858    validation_1-logloss:0.47278
[165]    validation_0-logloss:0.45812    validation_1-logloss:0.47238
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[168]    validation_0-logloss:0.45670    validation_1-logloss:0.47117
[169]    validation_0-logloss:0.45622    validation_1-logloss:0.47077
[170]    validation_0-logloss:0.45576    validation_1-logloss:0.47038
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[172]    validation_0-logloss:0.45488    validation_1-logloss:0.46962
[173]    validation_0-logloss:0.45444    validation_1-logloss:0.46924
[174]    validation_0-logloss:0.45401    validation_1-logloss:0.46889
[175]    validation_0-logloss:0.45358    validation_1-logloss:0.46851
[176]    validation_0-logloss:0.45314    validation_1-logloss:0.46814
[177]    validation_0-logloss:0.45269    validation_1-logloss:0.46774
[178]    validation_0-logloss:0.45225    validation_1-logloss:0.46739
[179]    validation_0-logloss:0.45183    validation_1-logloss:0.46702
[180]    validation_0-logloss:0.45141    validation_1-logloss:0.46666
```

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[181]    validation_0-logloss:0.45096    validation_1-logloss:0.46631
[182]    validation_0-logloss:0.45055    validation_1-logloss:0.46594
[183]    validation_0-logloss:0.45014    validation_1-logloss:0.46563
[184]    validation_0-logloss:0.44974    validation_1-logloss:0.46529
[185]    validation_0-logloss:0.44935    validation_1-logloss:0.46495
[186]    validation_0-logloss:0.44895    validation_1-logloss:0.46462
[187]    validation_0-logloss:0.44857    validation_1-logloss:0.46429
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[190]    validation_0-logloss:0.44738    validation_1-logloss:0.46331
[191]    validation_0-logloss:0.44699    validation_1-logloss:0.46295
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[193]    validation_0-logloss:0.44623    validation_1-logloss:0.46236
[194]    validation_0-logloss:0.44586    validation_1-logloss:0.46209
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[196]    validation_0-logloss:0.44516    validation_1-logloss:0.46154
[197]    validation_0-logloss:0.44481    validation_1-logloss:0.46127
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[204]    validation_0-logloss:0.44229    validation_1-logloss:0.45925
[205]    validation_0-logloss:0.44194    validation_1-logloss:0.45895
[206]    validation_0-logloss:0.44159    validation_1-logloss:0.45867
[207]    validation_0-logloss:0.44123    validation_1-logloss:0.45839
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[210]    validation_0-logloss:0.44026    validation_1-logloss:0.45758
[211]    validation_0-logloss:0.43993    validation_1-logloss:0.45733
[212]    validation_0-logloss:0.43961    validation_1-logloss:0.45708
[213]    validation_0-logloss:0.43929    validation_1-logloss:0.45681
[214]    validation_0-logloss:0.43898    validation_1-logloss:0.45654
[215]    validation_0-logloss:0.43867    validation_1-logloss:0.45629
[216]    validation_0-logloss:0.43834    validation_1-logloss:0.45605
[217]    validation_0-logloss:0.43804    validation_1-logloss:0.45582
[218]    validation_0-logloss:0.43775    validation_1-logloss:0.45559
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[231]    validation_0-logloss:0.43395    validation_1-logloss:0.45273
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[233]    validation_0-logloss:0.43343    validation_1-logloss:0.45234
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[237]    validation_0-logloss:0.43239    validation_1-logloss:0.45158
[238]    validation_0-logloss:0.43212    validation_1-logloss:0.45136
[239]    validation_0-logloss:0.43186    validation_1-logloss:0.45117
```

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[240]    validation_0-logloss:0.43159    validation_1-logloss:0.45098
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[242]    validation_0-logloss:0.43103    validation_1-logloss:0.45058
[243]    validation_0-logloss:0.43077    validation_1-logloss:0.45038
[244]    validation_0-logloss:0.43050    validation_1-logloss:0.45020
[245]    validation_0-logloss:0.43026    validation_1-logloss:0.45002
[246]    validation_0-logloss:0.42998    validation_1-logloss:0.44982
[247]    validation_0-logloss:0.42971    validation_1-logloss:0.44962
[248]    validation_0-logloss:0.42945    validation_1-logloss:0.44942
[249]    validation_0-logloss:0.42922    validation_1-logloss:0.44923
[250]    validation_0-logloss:0.42899    validation_1-logloss:0.44904
[251]    validation_0-logloss:0.42875    validation_1-logloss:0.44885
[252]    validation_0-logloss:0.42849    validation_1-logloss:0.44869
[253]    validation_0-logloss:0.42825    validation_1-logloss:0.44850
[254]    validation_0-logloss:0.42801    validation_1-logloss:0.44835
[255]    validation_0-logloss:0.42778    validation_1-logloss:0.44822
[256]    validation_0-logloss:0.42755    validation_1-logloss:0.44805
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[262]    validation_0-logloss:0.42621    validation_1-logloss:0.44705
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[272]    validation_0-logloss:0.42407    validation_1-logloss:0.44560
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[274]    validation_0-logloss:0.42368    validation_1-logloss:0.44532
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[297]    validation_0-logloss:0.41916    validation_1-logloss:0.44237
[298]    validation_0-logloss:0.41900    validation_1-logloss:0.44227
```

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[313]    validation_0-logloss:0.41641    validation_1-logloss:0.44062
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[325]    validation_0-logloss:0.41451    validation_1-logloss:0.43939
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[331]    validation_0-logloss:0.41356    validation_1-logloss:0.43887
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[357]    validation_0-logloss:0.40997    validation_1-logloss:0.43676
```

```
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[416]    validation_0-logloss:0.40313    validation_1-logloss:0.43346
```

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[474]    validation_0-logloss:0.39758    validation_1-logloss:0.43117
[475]    validation_0-logloss:0.39749    validation_1-logloss:0.43115
```

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[593]    validation_0-logloss:0.38810    validation_1-logloss:0.42809
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```

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[741]    validation_0-logloss:0.37823    validation_1-logloss:0.42549
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[759]    validation_0-logloss:0.37726    validation_1-logloss:0.42521
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[769]    validation_0-logloss:0.37672    validation_1-logloss:0.42507
[770]    validation_0-logloss:0.37665    validation_1-logloss:0.42506
```
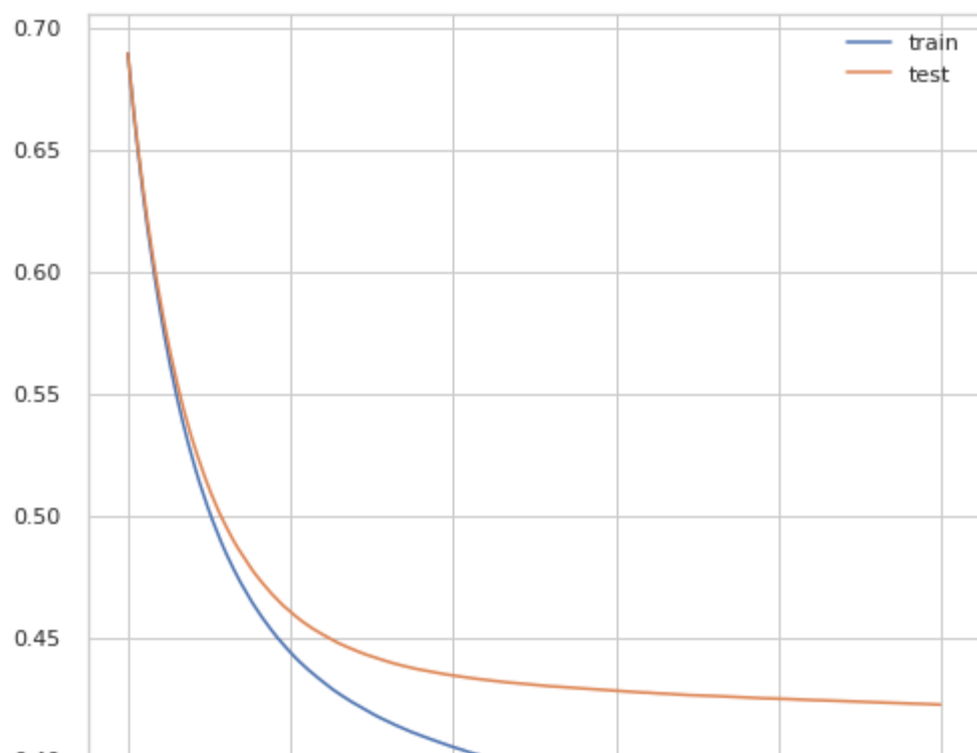
```
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[829]    validation_0-logloss:0.37344    validation_1-logloss:0.42429
```

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```

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```

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[993]    validation_0-logloss:0.36529    validation_1-logloss:0.42235
[994]    validation_0-logloss:0.36525    validation_1-logloss:0.42234
[995]    validation_0-logloss:0.36520    validation_1-logloss:0.42236
[996]    validation_0-logloss:0.36516    validation_1-logloss:0.42235
[997]    validation_0-logloss:0.36509    validation_1-logloss:0.42233
[998]    validation_0-logloss:0.36505    validation_1-logloss:0.42230
```

Out[20]:   `<matplotlib.legend.Legend at 0x7f33c9d9f6d0>`

In [ ]: