Spam Detection HW

Read complete instructions before starting the HW

Q1: Load the dataset (1 Point)

- For this Hw you will usespam dataset from kaggle which can be found from this link.
 You can download this data and either upload it in google drive or in colab workspace. Load the data in pandas dataframe.
- There are only two useful columns. These columns are related to (1) label (ham and spam) and the (2) text of email.
- Rename columns as label and message
- Find the % ham amd spam in the data.

```
In []: import pandas as pd
   if 'google.colab' in str(get_ipython()):
        spam_df = pd.read_csv('spam.csv', encoding='latin-1')
   else:
        spam_df = pd.read_csv('/Users/harikrishnadev/Library/CloudStorage/Google
        spam_df = spam_df[['v1','v2']]
        spam_df.columns = ['label', 'message']
        spam_df.head()
```

```
py:1: DeprecationWarning:
       Pyarrow will become a required dependency of pandas in the next major releas
       e of pandas (pandas 3.0),
       (to allow more performant data types, such as the Arrow string type, and bet
       ter interoperability with other libraries)
       but was not found to be installed on your system.
       If this would cause problems for you,
       please provide us feedback at https://github.com/pandas-dev/pandas/issues/54
       466
         import pandas as pd
Out[]:
            label
                                                  message
                     Go until jurong point, crazy.. Available only ...
         0
             ham
         1
                                     Ok lar... Joking wif u oni...
             ham
         2 spam Free entry in 2 a wkly comp to win FA Cup fina...
             ham
                   U dun say so early hor... U c already then say...
                    Nah I don't think he goes to usf, he lives aro...
             ham
        spam_df['label'].value_counts()
In [ ]:
Out[]:
         label
                  4825
         ham
                   747
         spam
         Name: count, dtype: int64
In []:
         spam df['label'].value counts(normalize=True)*100
Out[]:
        label
         ham
                  86.593683
                  13,406317
         spam
         Name: proportion, dtype: float64
```

In []: spam_df['label'].replace({'ham':0, 'spam':1}, inplace=True)

/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/1337418617.

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/1359867004. py:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method. The behavior will change in pandas 3.0. This inplace method will never work

The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behave s as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'd f.method({col: value}, inplace=True)' or df[col] = df[col].method(value) ins tead, to perform the operation inplace on the original object.

spam_df['label'].replace({'ham':0, 'spam':1}, inplace=True)
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/1359867004.
py:1: FutureWarning: Downcasting behavior in `replace` is deprecated and wil
l be removed in a future version. To retain the old behavior, explicitly cal
l `result.infer_objects(copy=False)`. To opt-in to the future behavior, set
`pd.set_option('future.no_silent_downcasting', True)`
spam_df['label'].replace({'ham':0, 'spam':1}, inplace=True)

```
In [ ]: spam_df['label'].value_counts(normalize=True)*100
```

Out[]: label

86.59368313.406317

Name: proportion, dtype: float64

Q2: Provide the metric for evaluating model (1 Point)

As you will notice, the data is highly imbalanced (most messages are labelled as ham and only few are labelled as spam). Always predicting ham will give us very good accuracy (close to 90%). So you need to choose a different metric.

Task: Provde the metric you will choose to evaluate your model. Explain why this is an appropriate metric for this case.

Using F1 Score for the minority class would help us. As it provides balance between Precision and recall. In this experiment, my trial with using recall led to decline in accuracy.

Q3: Classification Pipelines (18 Points)

In the previous lectures you learned Data processing, Featurization such as CountVectorizer, TFIDFVectorizer, and also Feature Engineering.

 You will now use following methods to create fearures which you can use in your model.

- 1. Sparse Embeddings (TF-IDF) (6 Points)
- 2. Feature Engineering (see examples below) (6 Points)
- 3. Sparse Embeddings (TF-IDF) + Feature Engineering (6 Points)

Approach:

****Use a smaller subset of dataset (e.g. 5-10 %) to evaluate the three pipelines. Based on your analysis (e.g. model score, learning curves), choose one pipeline from the three. Provde your rational for choosing the pipleine. Train only the final pipeline on randomly selected larger subset (e.g. 40%) of the data.**

Requirements:

- 1. You can use any ML model (Logistic Regression, XgBoost) for the classification. You will need to tune the **model for imbalanced dataset** (The link on XGBoost tutorial for imbalanced data: https://machinelearningmastery.com/xgboost-for-imbalanced-classification/).
- 2. For feature engineering, you can choose from the examples below. You do not have to use all of them. You can add other features as well. Think about what faetures can distinguish a spam from a regular email. Some examples:

Count of following (Words, characters, digits, exclamation marks, numbers, Nouns, ProperNouns, AUX, VERBS, Adjectives, named entities, spelling mistakes (see the link on how to get spelling mistakes https://pypi.org/project/pyspellchecker/).

- 3. For Sparse embeddings you will use **tfidf vectorization**. You need to choose appopriate parameters e.g. min_df, max_df, max_faetures, n-grams etc.).
- 4. Think carefully about the pre-processing you will do.

Tip: Using GridSearch for hyperparameter tuning might take a lot of time. Try using RandomizedSearch. You can also explore faster implementation of Gridsearch and RandomizedSearch in sklearn:

- 1. Halving Grid Search
- 2. HalvingRandomSearchCV

Required Submissions:

1. Submit two colab/jupyter notebooks

- (analysis with smaller subset and all three pipelines)
- (analysis with bigger subset and only final pipeline)
- 2. Pdf version of the notebooks (HWs will not be graded if pdf version is not provided.
- 3. The notebooks and pdf files should have the output.
- 4. Name files as follows: FirstName_file1_hw2, FirstName_file2_h2

4 0 I thk 50 shd be ok he said plus minus 10.. Did...

```
In []: spam_df_small['label'].value_counts(normalize=True)*100
```

I though we shd go out n have some fun so bar ...

Out[]: label 0 87.81362 1 12.18638

3

0

Name: proportion, dtype: float64

df.sample was able to create a stratified sample without specificying. If this wasn't the case I would try using methods mention in this article.

```
In []: import sklearn
    from sklearn.model_selection import train_test_split
    X = spam_df_small['message'].values
    y = spam_df_small['label'].values

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,straprint(X_train[:5])
    print(y_train[:5])
    print(X_test[:5])
    print(y_test[:5])
```

```
['No b4 Thursday'
        'So many people seems to be special at first sight, But only very few will
       remain special to you till your last sight. Maintain them till life ends..
       Sh!ias'
        "Like I made him throw up when we were smoking in our friend's car one tim
       e, it was awesome"
        'Mmm thats better now i got a roast down me! iåÕd b better if i had a few d
       rinks down me 2! Good indian?'
        'HI DARLIN IM MISSIN U HOPE YOU ARE HAVING A GOOD TIME. WHEN ARE U BACK AND
       WHAT TIME IF U CAN GIVE ME A CALL AT HOME, JESS XX']
       [0 \ 0 \ 0 \ 0]
In [ ]: import sys
        if 'google.colab' in str(get_ipython()):
            from google.colab import drive
            drive.mount('/content/drive')
            !pip install -U nltk -qq
            !pip install -U spacy -qq
            !pip install -U scikit-optimize -qq
            !python -m spacy download en core web sm -qq
            !pip install pyspellchecker -qq
            !pip install optuna -qq
            basepath = '/content/drive/MyDrive/Colab_Notebooks/BUAN_6342_Applied_Nat
            sys.path.append('/content/drive/MyDrive/Colab Notebooks/BUAN 6342 Applie
        else:
            basepath = '/Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harik
            sys.path.append(
                '/Users/harikrishnadev/Library/CloudStorage/GoogleDrive—harikrish060
In [ ]: from pathlib import Path
        base folder = Path(basepath)
        data folder = base folder/'0 Data Folder'
        model folder = base folder/'models/spam'
        custom functions = base folder/'custom-functions'
In [ ]: import CustomPreprocessorSpacy as cp
        from FeaturizerSpacy_w_SpellChecker import ManualFeatures
        from plot learning curve import plot learning curve
In [ ]: import spacy
        nlp = spacy.load('en_core_web_sm')
In [ ]: cpp = cp.SpacyPreprocessor(model = 'en_core_web_sm', batch_size=500)
```

['\\HELLO U.CALL WEN U FINISH WRK.I FANCY MEETIN UP WIV U ALL TONITE AS I NE

'Abeq, make profit. But its a start. Are you using it to get sponsors for t

'Your free ringtone is waiting to be collected. Simply text the password

ED A BREAK FROM DABOOKS. DID 4 HRS LAST NITE+2 TODAY OF WRK!\\""

\\MIX\\" to 85069 to verify. Get Usher and Britney. FML'

'Play w computer? Aiyah i tok 2 u lor?']

he next event?'

[0 0 0 1 0]

'I sent them. Do you like?'

```
In [ ]: X_train_cleaned_bow = cpp.transform(X train)
        X test cleaned bow = cpp.transform(X test)
       /Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harikrish0607@gmail.c
       om/My Drive/Colab Notebooks/BUAN 6342 Applied Natural Language Processing/0
       Custom files/CustomPreprocessorSpacy.py:83: MarkupResemblesLocatorWarning: T
       he input looks more like a filename than markup. You may want to open this f
       ile and pass the filehandle into Beautiful Soup.
         soup = BeautifulSoup(text, "html.parser")
In [ ]: # Import the joblib library for saving and loading models
        import joblib
        import os
        file_X_train_cleaned_bow = data_folder / 'x_train_cleaned_bow_small.pkl'
        os.makedirs(os.path.dirname(file_X_train_cleaned_bow), exist_ok=True)
        joblib.dump(X_train_cleaned_bow, file_X_train_cleaned_bow)
        file_X_test_cleaned_bow = data_folder / 'x_test_cleaned_bow_small.pkl'
        os.makedirs(os.path.dirname(file_X_test_cleaned_bow), exist_ok=True)
        joblib.dump(X_test_cleaned_bow, file_X_test_cleaned_bow)
Out[]: ['/Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harikrish0607@gmai
        l.com/My Drive/Colab Notebooks/BUAN 6342 Applied Natural Language Processin
        g/0_Data_Folder/x_test_cleaned_bow_small.pkl']
In [ ]: import numpy as np
        unique, counts = np.unique(y train,return counts=True)
        print(dict(zip(unique, counts/sum(counts))))
       {0: 0.8789237668161435, 1: 0.1210762331838565}
In []: weights = dict(zip(unique[::-1], counts/sum(counts)))
        weights
Out[]: {1: 0.8789237668161435, 0: 0.1210762331838565}
```

Sparse Embeddings

```
import optuna
from sklearn.model_selection import cross_val_score
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.linear_model import LogisticRegression
from sklearn.pipeline import Pipeline
from sklearn.metrics import make_scorer, f1_score, recall_score, precision_s

def objective(trial):
    # Define the hyperparameters to search over
    max_features = trial.suggest_int('max_features', 100, 10000)
    C = trial.suggest_loguniform('C', 1e-5, 100)
    weight = trial.suggest_float('weight', 0.1, 0.9)

class_weight = {0: 1 - weight, 1: weight}
```

/opt/homebrew/anaconda3/envs/nlp/lib/python3.11/site-packages/tqdm/auto.py:2
1: TqdmWarning: IProgress not found. Please update jupyter and ipywidgets. S
ee https://ipywidgets.readthedocs.io/en/stable/user_install.html
 from .autonotebook import tqdm as notebook_tqdm

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

```
[I 2024-02-10 23:08:31,822] A new study created in memory with name: no-name
-5a16edf9-5b7b-455e-b4e3-161d7d7b954f
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:31,876] Trial 0 finished with value: 0.0 and parameters:
{'max_features': 2476, 'C': 3.8921654582684453, 'weight': 0.549451448517344
3}. Best is trial 0 with value: 0.0.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:31,924] Trial 1 finished with value: 0.0 and parameters:
{'max_features': 8191, 'C': 8.519509734421042e-05, 'weight': 0.3315920018226
065}. Best is trial 0 with value: 0.0.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:31,964] Trial 2 finished with value: 0.0 and parameters:
{'max_features': 9292, 'C': 0.09175637103517915, 'weight': 0.288487410414817
5}. Best is trial 0 with value: 0.0.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,010] Trial 3 finished with value: 0.24761904761904763
and parameters: {'max_features': 3867, 'C': 4.006492935614388, 'weight': 0.6
74061161275147}. Best is trial 3 with value: 0.24761904761904763.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,056] Trial 4 finished with value: 0.0 and parameters:
{'max_features': 950, 'C': 0.0003041536862666951, 'weight': 0.42605940865926
706}. Best is trial 3 with value: 0.24761904761904763.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,103] Trial 5 finished with value: 0.4599999999999999
and parameters: {'max_features': 723, 'C': 25.89610640961438, 'weight': 0.28
91556060132602}. Best is trial 5 with value: 0.4599999999999996.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,158] Trial 6 finished with value: 0.7779220779220779
```

```
and parameters: {'max_features': 7241, 'C': 42.84264067041149, 'weight': 0.7
193900354414825}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,202] Trial 7 finished with value: 0.0 and parameters:
{'max features': 654, 'C': 2.4168385869434722e-05, 'weight': 0.2860332861089
4063}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,245] Trial 8 finished with value: 0.0 and parameters:
{'max_features': 1798, 'C': 3.744743793705783e-05, 'weight': 0.8351753526084
889}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,284] Trial 9 finished with value: 0.0 and parameters:
{'max_features': 1816, 'C': 0.0043737472481470314, 'weight': 0.8387966108639
938}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,335] Trial 10 finished with value: 0.0 and parameter
s: {'max_features': 6372, 'C': 0.16181061444037484, 'weight': 0.108636281238
2835}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,392] Trial 11 finished with value: 0.7422077922077921
and parameters: {'max_features': 6299, 'C': 38.33873854584034, 'weight': 0.5
939320814273596}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,450] Trial 12 finished with value: 0.7779220779220779
and parameters: {'max_features': 6165, 'C': 66.19714280442518, 'weight': 0.6
698691126121801}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,506] Trial 13 finished with value: 0.7779220779220779
```

```
and parameters: {'max_features': 6747, 'C': 94.71589627314549, 'weight': 0.6
810524429094758}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,553] Trial 14 finished with value: 0.0 and parameter
s: {'max features': 4030, 'C': 1.5440168273369266, 'weight': 0.7425448401011
934}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,600] Trial 15 finished with value: 0.5021260221260221
and parameters: {'max_features': 7853, 'C': 0.5903962509110549, 'weight': 0.
8947233669927717}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,648] Trial 16 finished with value: 0.0 and parameter
s: {'max_features': 5072, 'C': 0.005434105523320505, 'weight': 0.75484179954
1067}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,705] Trial 17 finished with value: 0.459999999999999
6 and parameters: {'max_features': 9736, 'C': 15.695341764284864, 'weight':
0.45087952820630933}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
and parameters: {'max_features': 7793, 'C': 6.290638582029828, 'weight': 0.6
057617623971517}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,810] Trial 19 finished with value: 0.0 and parameter
s: {'max_features': 5146, 'C': 0.012728243726873431, 'weight': 0.66876957185
80122}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,860] Trial 20 finished with value: 0.0 and parameter
```

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s: {'max_features': 8844, 'C': 0.5449539009675118, 'weight': 0.5143970371868
505}. Best is trial 6 with value: 0.7779220779220779.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,921] Trial 21 finished with value: 0.8136363636363637
and parameters: {'max features': 6535, 'C': 86.85968731553228, 'weight': 0.7
223859779796933}. Best is trial 21 with value: 0.81363636363637.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:32,984] Trial 22 finished with value: 0.8414141414141415
and parameters: {'max_features': 7131, 'C': 55.13512210788287, 'weight': 0.7
603399740971155}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,048] Trial 23 finished with value: 0.8414141414141415
and parameters: {'max_features': 7348, 'C': 95.20465604458447, 'weight': 0.7
810263350711478}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,109] Trial 24 finished with value: 0.8136363636363637
and parameters: {'max_features': 5606, 'C': 10.724638729321496, 'weight': 0.
8074571739223753}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,161] Trial 25 finished with value: 0.7615384615384615
and parameters: {'max_features': 8550, 'C': 1.7925578363666743, 'weight': 0.
8999623441144986}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,223] Trial 26 finished with value: 0.8414141414141415
and parameters: {'max_features': 3944, 'C': 83.62123984058353, 'weight': 0.8
009942021511018}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,284] Trial 27 finished with value: 0.8136363636363637
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and parameters: {'max_features': 3982, 'C': 14.747125989669309, 'weight': 0.
7977761474990664}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,338] Trial 28 finished with value: 0.0 and parameter
s: {'max features': 2886, 'C': 1.0464504614810914, 'weight': 0.6213149573044
026}. Best is trial 22 with value: 0.8414141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,388] Trial 29 finished with value: 0.0 and parameter
s: {'max_features': 4389, 'C': 0.0007282571891177424, 'weight': 0.7825918831
810894}. Best is trial 22 with value: 0.8414141414141415.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,441] Trial 30 finished with value: 0.1904761904761904
7 and parameters: {'max_features': 2817, 'C': 5.815544749503557, 'weight':
0.5579689607726369}. Best is trial 22 with value: 0.84141414141415.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,494] Trial 31 finished with value: 0.86919191919192
and parameters: {'max_features': 6948, 'C': 76.68898786614541, 'weight': 0.8
599259280257776}. Best is trial 31 with value: 0.86919191919192.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,546] Trial 32 finished with value: 0.86919191919192
and parameters: {'max_features': 7088, 'C': 24.631476811277686, 'weight': 0.
8571502008666536}. Best is trial 31 with value: 0.8691919191919192.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,603] Trial 33 finished with value: 0.86919191919192
and parameters: {'max_features': 7302, 'C': 22.981123044899377, 'weight': 0.
8645389653195866}. Best is trial 31 with value: 0.86919191919192.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,653] Trial 34 finished with value: 0.8818181818181818
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and parameters: {'max_features': 7103, 'C': 2.7089241002219673, 'weight': 0.
8778668934149352}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,701] Trial 35 finished with value: 0.0 and parameter
s: {'max features': 5711, 'C': 0.1678220214017634, 'weight': 0.8626088743436
221}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,751] Trial 36 finished with value: 0.8414141414141415
and parameters: {'max_features': 8038, 'C': 3.127997700383461, 'weight': 0.8
628869621183565}. Best is trial 34 with value: 0.88181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,802] Trial 37 finished with value: 0.86919191919192
and parameters: {'max_features': 9118, 'C': 19.16835296146711, 'weight': 0.8
559205425426222}. Best is trial 34 with value: 0.881818181818181.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,853] Trial 38 finished with value: 0.0 and parameter
s: {'max_features': 8470, 'C': 0.04607889479192202, 'weight': 0.147959110350
47843}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:33,912] Trial 39 finished with value: 0.8136363636363637
and parameters: {'max_features': 7367, 'C': 5.964951060824025, 'weight': 0.8
249902968479513}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,013] Trial 40 finished with value: 0.8818181818181818
and parameters: {'max_features': 5690, 'C': 21.11473487456487, 'weight': 0.8
993688765091211}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,079] Trial 41 finished with value: 0.8818181818181818
```

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and parameters: {'max_features': 6982, 'C': 25.842981190427704, 'weight': 0.
895662617384496}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,134] Trial 42 finished with value: 0.8818181818181818
and parameters: {'max features': 5772, 'C': 9.176658001280822, 'weight': 0.8
805236197500543}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,191] Trial 43 finished with value: 0.8569696969697
and parameters: {'max_features': 5656, 'C': 8.178860476768577, 'weight': 0.8
997801951872683}. Best is trial 34 with value: 0.88181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,246] Trial 44 finished with value: 0.8484848484848484
and parameters: {'max_features': 6095, 'C': 3.125625472373995, 'weight': 0.8
988537831199681}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,307] Trial 45 finished with value: 0.86919191919192
and parameters: {'max_features': 4831, 'C': 32.94852004806848, 'weight': 0.8
411426662005764}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,356] Trial 46 finished with value: 0.0 and parameter
s: {'max_features': 6730, 'C': 0.5703905672009154, 'weight': 0.7201182947627
922}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
6 and parameters: {'max_features': 5989, 'C': 2.442684334597523, 'weight':
0.8156038847160165}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,460] Trial 48 finished with value: 0.0 and parameter
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s: {'max_features': 6723, 'C': 0.21328161674682208, 'weight': 0.316074035406
64836}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,521] Trial 49 finished with value: 0.84141414141415
and parameters: {'max features': 4738, 'C': 36.42733330522051, 'weight': 0.7
721324809820449}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,580] Trial 50 finished with value: 0.399999999999999
7 and parameters: {'max_features': 5138, 'C': 15.331924831943466, 'weight':
0.3592826302233286}. Best is trial 34 with value: 0.88181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,636] Trial 51 finished with value: 0.86919191919192
and parameters: {'max_features': 7052, 'C': 30.33399282872651, 'weight': 0.8
664725464611243}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,696] Trial 52 finished with value: 0.8414141414141415
and parameters: {'max_features': 7648, 'C': 10.575737936446993, 'weight': 0.
8304549655962981}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,754] Trial 53 finished with value: 0.854040404040404
and parameters: {'max_features': 5488, 'C': 48.51861974433064, 'weight': 0.8
746746463150438}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
3 and parameters: {'max_features': 6347, 'C': 0.9826835969845874, 'weight':
0.8281053538997948}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,858] Trial 55 finished with value: 0.8818181818181818
```

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and parameters: {'max_features': 7608, 'C': 5.548414213907934, 'weight': 0.8
782569317663655}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
 C = trial.suggest_loguniform('C', 1e-5, 100)
6 and parameters: {'max features': 8208, 'C': 5.511123437115329, 'weight':
0.6927149135460124}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
 C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:34,966] Trial 57 finished with value: 0.0 and parameter
s: {'max_features': 5934, 'C': 3.5936304195203133, 'weight': 0.2404159087587
1816}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
 C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,020] Trial 58 finished with value: 0.0 and parameter
s: {'max_features': 7720, 'C': 1.3504080586073857e-05, 'weight': 0.744980387
9769463}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
 C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,071] Trial 59 finished with value: 0.1216326530612244
8 and parameters: {'max_features': 3380, 'C': 0.0003671066124270534, 'weigh
t': 0.8808229840814742}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
 C = trial.suggest_loguniform('C', 1e-5, 100)
3 and parameters: {'max_features': 6786, 'C': 1.4425863647324149, 'weight':
0.8016867736486648}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
 C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,181] Trial 61 finished with value: 0.8414141414141415
and parameters: {'max_features': 6961, 'C': 10.318390593200936, 'weight': 0.
8419197707589869}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
 C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,237] Trial 62 finished with value: 0.8818181818181818
```

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and parameters: {'max_features': 6472, 'C': 20.688333873615466, 'weight': 0.
8804866781101516}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,297] Trial 63 finished with value: 0.8540404040404042
and parameters: {'max features': 6425, 'C': 52.91954973945353, 'weight': 0.8
859989061600198}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,359] Trial 64 finished with value: 0.8414141414141415
and parameters: {'max_features': 7563, 'C': 16.332298874604184, 'weight': 0.
8390750338780546}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,410] Trial 65 finished with value: 0.0 and parameter
s: {'max_features': 5307, 'C': 0.3526141897217177, 'weight': 0.7871828887278
762}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,461] Trial 66 finished with value: 0.805050505050505
and parameters: {'max_features': 267, 'C': 57.356781548932176, 'weight': 0.8
988075347357515}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,524] Trial 67 finished with value: 0.81363636363637
and parameters: {'max_features': 8169, 'C': 8.864144480142919, 'weight': 0.8
098095116468469}. Best is trial 34 with value: 0.8818181818181818.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,576] Trial 68 finished with value: 0.8969696969696969
and parameters: {'max_features': 5865, 'C': 4.08525761456645, 'weight': 0.87
35645566660062}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,633] Trial 69 finished with value: 0.0 and parameter
```

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s: {'max_features': 4448, 'C': 4.712517284700244, 'weight': 0.46730381893522
62}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
3 and parameters: {'max features': 6516, 'C': 2.1546612546599238, 'weight':
0.7391101539090685}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,740] Trial 71 finished with value: 0.854040404040404
and parameters: {'max_features': 5761, 'C': 21.700559304315004, 'weight': 0.
8730020752182825}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,796] Trial 72 finished with value: 0.86919191919192
and parameters: {'max_features': 6091, 'C': 13.153159343385692, 'weight': 0.
8498746694093607}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,854] Trial 73 finished with value: 0.854040404040404
and parameters: {'max_features': 5367, 'C': 34.78451105576151, 'weight': 0.8
718037325283874}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,918] Trial 74 finished with value: 0.8414141414141415
and parameters: {'max_features': 7457, 'C': 91.32380303827793, 'weight': 0.8
197811219332116}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:35,975] Trial 75 finished with value: 0.8414141414141415
and parameters: {'max_features': 6242, 'C': 7.350972758453487, 'weight': 0.8
520919499882816}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,028] Trial 76 finished with value: 0.0 and parameter
```

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s: {'max_features': 6892, 'C': 0.8765526059872906, 'weight': 0.7764699288856
085}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,079] Trial 77 finished with value: 0.1216326530612244
8 and parameters: {'max features': 7990, 'C': 0.0024247256054627216, 'weigh
t': 0.8797763717438692}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,135] Trial 78 finished with value: 0.8484848484848484
and parameters: {'max_features': 6572, 'C': 3.7836445786300557, 'weight': 0.
898942707917826}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,190] Trial 79 finished with value: 0.0 and parameter
s: {'max_features': 5861, 'C': 8.538650501703321e-05, 'weight': 0.7637184851
690486}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,253] Trial 80 finished with value: 0.8414141414141415
and parameters: {'max_features': 1368, 'C': 25.50665828047232, 'weight': 0.8
007489580316813}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,314] Trial 81 finished with value: 0.86919191919192
and parameters: {'max_features': 7105, 'C': 22.535585426327717, 'weight': 0.
8481615809267455}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,371] Trial 82 finished with value: 0.86919191919192
and parameters: {'max_features': 7193, 'C': 63.792889987885495, 'weight': 0.
8565927749607846}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,438] Trial 83 finished with value: 0.8414141414141415
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and parameters: {'max_features': 6233, 'C': 12.896656188904487, 'weight': 0.
8268382086127173}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,497] Trial 84 finished with value: 0.8540404040404042
and parameters: {'max features': 8540, 'C': 37.23182475782217, 'weight': 0.8
808834157453107}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,549] Trial 85 finished with value: 0.0 and parameter
s: {'max_features': 4828, 'C': 0.02252310945139668, 'weight': 0.855772898374
5081}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
6 and parameters: {'max_features': 6633, 'C': 7.910213710627018, 'weight':
0.6355731677346573}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,661] Trial 87 finished with value: 0.5076190476190476
and parameters: {'max_features': 6930, 'C': 2.413375030551584, 'weight': 0.8
228157925858361}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,721] Trial 88 finished with value: 0.8818181818181818
and parameters: {'max_features': 7322, 'C': 17.850872761232544, 'weight': 0.
8819930437209158}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,776] Trial 89 finished with value: 0.88181818181818
and parameters: {'max_features': 7796, 'C': 5.224967740464941, 'weight': 0.8
832651922843835}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,828] Trial 90 finished with value: 0.87919191919192
```

```
and parameters: {'max_features': 9165, 'C': 1.3033029796744144, 'weight': 0.
8793396825816969}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,883] Trial 91 finished with value: 0.8424242424242424
and parameters: {'max features': 9971, 'C': 1.6111357246828657, 'weight': 0.
8841804271513739}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,941] Trial 92 finished with value: 0.864040404040404
and parameters: {'max_features': 7835, 'C': 4.32644560418139, 'weight': 0.88
39296117381557}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:36,999] Trial 93 finished with value: 0.7779220779220779
and parameters: {'max_features': 9276, 'C': 2.8816177289204554, 'weight': 0.
842123671064082}. Best is trial 68 with value: 0.896969696969696.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:37,058] Trial 94 finished with value: 0.8569696969697
and parameters: {'max_features': 9051, 'C': 5.408160602440342, 'weight': 0.8
984364900065213}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:37,112] Trial 95 finished with value: 0.8969696969696969
and parameters: {'max_features': 9621, 'C': 1.3517769723445567, 'weight': 0.
8768446482702812}. Best is trial 68 with value: 0.8969696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:37,162] Trial 96 finished with value: 0.0 and parameter
s: {'max_features': 7520, 'C': 0.08944473927841032, 'weight': 0.867583846509
8495}. Best is trial 68 with value: 0.89696969696969.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:08:37,214] Trial 97 finished with value: 0.0 and parameter
```

```
1052}. Best is trial 68 with value: 0.8969696969696969.
       /var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/3743568161.
       py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
       feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
       ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
        C = trial.suggest_loguniform('C', 1e-5, 100)
       [I 2024-02-10 23:08:37,280] Trial 98 finished with value: 0.8136363636363637
       and parameters: {'max features': 8263, 'C': 15.563943354690853, 'weight': 0.
       7872999846474028}. Best is trial 68 with value: 0.8969696969696969.
       /var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/3743568161.
       py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
       feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
       ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
        C = trial.suggest loguniform('C', 1e-5, 100)
       3 and parameters: {'max_features': 5521, 'C': 10.20599736990684, 'weight':
       0.3804324559004176}. Best is trial 68 with value: 0.8969696969696969.
In []: # Get the best hyperparameters found by Optuna
        best_max_features = study.best_params['max_features']
        best C = study.best params['C']
        best weight = study.best params['weight']
In [ ]: study.best_params
Out[]: {'max features': 5865, 'C': 4.08525761456645, 'weight': 0.8735645566660062}
In [ ]: study.best value
Out[]: 0.89696969696969
In [ ]: best classifier 1 = Pipeline([
            ('vectorizer', TfidfVectorizer(analyzer='word', token_pattern=r"[\S]+",
            ('classifier', LogisticRegression(max_iter=10000, C=best_C,class_weight=
        ])
In [ ]: best_classifier_1.fit(X_train_cleaned_bow, y_train)
Out[]: |
                 Pipeline
            ▶ TfidfVectorizer
           LogisticRegression
In [ ]: print(f'Best cross-validation score: {study.best value:.2f}')
        print("\nBest parameters: ", study.best_params)
        print("\nBest estimator: ", best classifier 1)
```

s: {'max_features': 9737, 'C': 0.37417050536783664, 'weight': 0.814708845071

```
Best parameters: {'max_features': 5865, 'C': 4.08525761456645, 'weight': 0.
       8735645566660062}
       Best estimator: Pipeline(steps=[('vectorizer',
                          TfidfVectorizer(max features=5865, token pattern='[\\S]
       +')),
                         ('classifier',
                          LogisticRegression(C=4.08525761456645,
                                               class_weight={0: 0.1264354433339938,
                                                              1: 0.8735645566660062},
                                               max iter=10000))))
In [ ]: study.__dict__
Out[]: {'study name': 'no-name-5a16edf9-5b7b-455e-b4e3-161d7d7b954f',
           '_study_id': 0,
           ' storage': <optuna.storages. in memory.InMemoryStorage at 0x2a15a54d0>,
           '_directions': [<StudyDirection.MAXIMIZE: 2>],
          'sampler': <optuna.samplers._tpe.sampler.TPESampler at 0x2a00033d0>,
           'pruner': <optuna.pruners. median.MedianPruner at 0x2a155ec50>,
           ' thread local': <optuna.study.study. ThreadLocalStudyAttribute at 0x2a175
         26f0>,
           ' stop flag': False}
In [ ]: plot_learning_curve(best_classifier_1, 'Learning Curves',
                              X_train_cleaned_bow, y_train, n_jobs=-1)
Out[]: <module 'matplotlib.pyplot' from '/opt/homebrew/anaconda3/envs/nlp/lib/pyth
         on3.11/site-packages/matplotlib/pyplot.py'>
                  Learning Curves
                                                                         Performance of the model
                                    0.011
                                                                 0.8
        0.8
                                    0.010
                                    0.009
        0.6
                                    0.008
                                    0.007
                                    0.006
            Training score
          Cross-validation score
                                                                 0.0
                                    0.005
                                                                   0.0065 0.0070 0.0075
                                                                             0.0080 0.0085 0.0090 0.0095
In [ ]: def final_pipeline(pipeline, cleaned_text):
             predictions = pipeline.predict(cleaned text)
             return predictions
         y_test_pred = final_pipeline(best_classifier_1,X_test_cleaned_bow)
In [ ]: import sklearn.metrics as metrics
         print('\nTest set classification report:\n\n',
               metrics.classification_report(y_test, y_test_pred))
```

Best cross-validation score: 0.90

Test set classification report:

	precision	recall	f1-score	support
0	0.96	1.00	0.98	49
1	1.00	0.71	0.83	7
accuracy			0.96	56
macro avg	0.98	0.86	0.91	56
weighted avg	0.97	0.96	0.96	56

Feature Engineering

```
In [ ]: X_train_cleaned_basic = cp.SpacyPreprocessor(model='en_core_web_sm',
                                                             lemmatize=False, lower=F
                                                             remove stop=False, remov
                                                             remove email=False, remd
                                                             add_user_mention_prefix
                                                             basic_clean_only=True).
       /Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harikrish0607@gmail.c
       om/My Drive/Colab_Notebooks/BUAN_6342_Applied_Natural_Language_Processing/0_
       Custom_files/CustomPreprocessorSpacy.py:83: MarkupResemblesLocatorWarning: T
       he input looks more like a filename than markup. You may want to open this f
       ile and pass the filehandle into Beautiful Soup.
         soup = BeautifulSoup(text, "html.parser")
In [ ]: # save this to a file
        file_X_train_cleaned_basic = data_folder / 'x_train_cleaned_basic_small.pkl
        joblib.dump(X train cleaned basic, file X train cleaned basic)
Out[]: ['/Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harikrish0607@gmai
        l.com/My Drive/Colab_Notebooks/BUAN_6342_Applied_Natural_Language_Processin
        q/0 Data Folder/x train cleaned basic small.pkl']
In [ ]: X test cleaned basic = cp.SpacyPreprocessor(model='en core web sm',
                                                             lemmatize=False, lower=F
                                                             remove_stop=False, remov
                                                             remove email=False, remo
                                                             add user mention prefix
                                                             basic_clean_only=True).
        file_X_test_cleaned_basic = data_folder / 'x_test_cleaned_basic_small.pkl'
        joblib.dump(X_test_cleaned_basic, file_X_test_cleaned_basic)
Out[]: ['/Users/harikrishnadev/Library/CloudStorage/GoogleDrive-harikrish0607@gmai
        l.com/My Drive/Colab Notebooks/BUAN 6342 Applied Natural Language Processin
        g/0_Data_Folder/x_test_cleaned_basic_small.pkl']
In [ ]: featurizer = ManualFeatures(spacy model='en core web sm', batch size = 1000)
        ManualFeatures??
```

```
Init signature:
ManualFeatures(
    spacy model,
    batch size=64,
    pos_features=True,
    ner features=True.
    text descriptive features=True,
    spell check=True,
Source:
class ManualFeatures(TransformerMixin, BaseEstimator):
    0.00
    A custom transformer that extracts manual features from text using spaC
y. It integrates well into scikit-learn
    pipelines and offers a variety of text features including Part-of-Speech
(POS) tags, Named Entity Recognition (NER) tags,
    and basic text descriptive statistics.
    Attributes:
        spacy_model (str): The spaCy language model to be used for tokenizat
ion and other NLP tasks.
        batch_size (int): The number of documents to process at once during
spaCy's pipeline processing.
        pos features (bool): If True, extract POS tag features.
        ner features (bool): If True, extract NER tag features.
        text_descriptive_features (bool): If True, extract basic text descri
ptive features such as word count, character count, etc.
   Methods:
        get cores() -> int:
            Determines the number of CPU cores to utilize for parallel proce
ssing, aiming to optimize performance.
        get_pos_features(cleaned_text: list) -> numpy.ndarray:
            Extracts POS tag features from the text, counting the occurrence
s of nouns, auxiliary verbs, main verbs, and adjectives.
        get ner features(cleaned text: list) -> numpy.ndarray:
            Extracts NER tag features from the text, counting the occurrence
s of named entities.
        get text descriptive features(cleaned text: list) -> numpy.ndarray:
            Extracts basic text descriptive features such as total word coun
t, character count (with and without spaces),
            average word length, digit count, number count, and sentence cou
nt.
        fit(X, y=None) -> 'ManualFeatures':
            Fits the transformer to the data. This is a dummy method for sci
kit-learn compatibility and does not change the state of the object.
        transform(X, y=None) -> tuple:
            Transforms the provided data using the defined feature extractio
```

n methods. It returns a tuple containing a 2D numpy array of the extracted f

eatures and a list of feature names.

```
Raises:
        TypeError: If the input X is not a list or a numpy array.
        Exception: For other exceptions that may occur during the transform
process.
    def init (self, spacy model, batch size = 64, pos features = True, ne
r_features = True, text_descriptive_features = True, spell_check=True):
        self.spacy model = spacy model
        self.batch size = batch size
        self.pos_features = pos_features
        self.ner features = ner features
        self.text_descriptive_features = text_descriptive_features
        self.spell_check = spell_check
        self.spell_checker = SpellChecker()
    def get cores(self):
        Get the number of CPU cores to use in parallel processing.
        # Get the number of CPU cores available on the system.
        num_cores = os.cpu_count()
        if num cores < 3:</pre>
            use\_cores = 1
        else:
            use_cores = num_cores // 2 + 1
        return num_cores
    def get_pos_features(self, cleaned_text):
        nlp = spacy.load(self.spacy model)
        noun count = []
        aux count = []
        verb count = []
        adj count =[]
        # Disable the lemmatizer and NER pipelines for improved performance
        disabled_pipes = ['lemmatizer', 'ner']
        with nlp.select_pipes(disable=disabled_pipes):
            n_process = self.get_cores()
            for doc in nlp.pipe(cleaned text, batch size=self.batch size, n
process=n_process):
                # Extract nouns, auxiliaries, verbs, and adjectives from the
document
                nouns = [token.text for token in doc if token.pos_ in ["NOU
N", "PROPN"]]
                auxs = [token.text for token in doc if token.pos in ["AU
X"11
                verbs = [token.text for token in doc if token.pos_ in ["VER
B"11
                adjectives = [token.text for token in doc if token.pos_ in
["ADJ"]]
```

```
# Store the count of each type of word in separate lists
                noun count.append(len(nouns))
                aux count.append(len(auxs))
                verb count.append(len(verbs))
                adj_count.append(len(adjectives))
        # Stack the count lists vertically to form a 2D numpy array
        return np.transpose(np.vstack((noun count, aux count, verb count, ad
j count)))
    def get ner features(self, cleaned text):
        nlp = spacy.load(self.spacy_model)
        count ner = []
        # Disable the tok2vec, tagger, parser, attribute ruler, and lemmatiz
er pipelines for improved performance
        disabled_pipes = ['tok2vec', 'tagger', 'parser', 'attribute_ruler',
'lemmatizer']
        with nlp.select_pipes(disable=disabled_pipes):
            n_process = self.get_cores()
            for doc in nlp.pipe(cleaned_text, batch_size=self.batch_size, n_
process=n_process):
                ners = [ent.label_ for ent in doc.ents]
                count ner.append(len(ners))
        # Convert the list of NER counts to a 2D numpy array
        return np.array(count_ner).reshape(-1, 1)
    def get spelling error features(self, cleaned text):
        if self.spell check:
            error counts = []
            for text in cleaned text:
            # Spell check the text and count the number of misspelled words
                corrected_text = self.spell_check_text(text)
                misspelled = self.spell checker.unknown(corrected text)
                error counts.append(len(misspelled))
            return np.array(error_counts).reshape(-1, 1)
        else:
            return np.zeros((len(cleaned text), 1)) # Return zeros if spell
check is disabled
    def spell check text(self, text):
        if self.spell check:
            return [self.spell_checker.correction(word) for word in text]
        else:
            return text
    def get_text_descriptive_features(self, cleaned_text):
        list_count_words = []
        list count characters = []
        list count characters no space = []
        list avg word length = []
        list count digits = []
```

```
list count numbers = []
        list_count_sentences = []
        nlp = spacy.load(self.spacy_model)
        disabled_pipes = ['tok2vec', 'tagger', 'parser', 'attribute_ruler',
'lemmatizer', 'ner']
        with nlp.select pipes(disable=disabled pipes):
            if not nlp.has pipe('sentencizer'):
                nlp.add pipe('sentencizer')
            n process = self.get cores()
            for doc in nlp.pipe(cleaned_text, batch_size=self.batch_size, n_
process=n process):
                count word = len([token for token in doc if not token.is pun
ctl)
                count char = len(doc.text)
                count char no space = len(doc.text with ws.replace(' ', ''))
                avg_word_length = count_char_no_space / (count_word + 1)
                count_numbers = len([token for token in doc if token.is_digi
t1)
                count_sentences = len(list(doc.sents))
                list count words.append(count word)
                list_count_characters.append(count_char)
                list_count_characters_no_space.append(count_char_no_space)
                list avg word length.append(avg word length)
                list count numbers.append(count numbers)
                list_count_sentences.append(count_sentences)
        text_descriptive_features = np.vstack((list_count_words, list_count_
characters, list_count_characters_no_space, list_avg_word_length,
                                    list count numbers, list count sentence
s))
        return np.transpose(text_descriptive_features)
    def fit(self, X, y=None):
        return self
    def transform(self, X, y=None):
        try:
            # Check if the input data is a list or numpy array
            if not isinstance(X, (list, np.ndarray)):
                raise TypeError(f"Expected list or numpy array, got {type
(X)}")
            feature names = []
            if self.text_descriptive_features:
                text descriptive features = self.get text descriptive featur
es(X)
                feature_names.extend(['count_words', 'count_characters',
                                      'count characters no space', 'avg word
```

```
'count_numbers', 'count_sentences'])
                   else:
                       text_descriptive_features = np.empty(shape=(0, 0))
                   # Add spelling error features
                   if self.spell check:
                       spelling_error_features = self.get_spelling_error_features
       (X)
                       feature names.append('spelling errors')
                   if self.pos features:
                       pos_features = self.get_pos_features(X)
                       feature_names.extend(['noun_count', 'aux_count', 'verb_coun
       t', 'adj count'])
                   else:
                       pos_features = np.empty(shape=(0, 0))
                   if self.ner features:
                       ner_features = self.get_ner_features(X)
                       feature_names.extend(['ner'])
                   else:
                       ner_features = np.empty(shape=(0, 0))
                   # Stack the feature arrays horizontally to form a single 2D nump
       y array
                   return np.hstack((text_descriptive_features, pos_features, ner_
       features, spelling_error_features)), feature_names
               except Exception as error:
                   print(f'An exception occured: {repr(error)}')
                       ~/Library/CloudStorage/GoogleDrive-harikrish0607@gmail.com/M
       y Drive/Colab_Notebooks/BUAN_6342_Applied_Natural_Language_Processing/0_Cust
       om_files/FeaturizerSpacy_w_SpellChecker.py
       Tvpe:
                       type
       Subclasses:
In [ ]: X_train_features, feature_names = featurizer.fit_transform(X_train_cleaned_b
In [ ]: X_train_features[0:3]
                             , 136.
                                            , 109.
Out[]: array([[ 28.
                                                              3.75862069.
                   1.
                                 2.
                                              12.
                                                              0.
                   3.
                                 2.
                                              1.
                                                                        ],
                [ 18.
                                              71.
                                                              3.73684211,
                                88.
                   0.
                                 3.
                                              4.
                                                              1.
                   3.
                                1.
                                               0.
                                                              2.85714286,
                  6.
                                25.
                                              20.
                   0.
                                 2.
                                               0.
                                                              1.
                                                                        ]])
                   2.
                                                              0.
                                 0.
                                               0.
In [ ]: feature names
```

_length',

```
Out[]: ['count_words',
         'count_characters',
         'count characters no space',
         'avg_word_length',
          'count_numbers',
          'count_sentences',
         'spelling errors',
         'noun_count',
         'aux_count',
          'verb_count',
          'adj_count',
         'ner']
In [ ]: classifier 2 = Pipeline([
            ('classifier', LogisticRegression(max_iter=10000)),
        ])
In [ ]: import optuna
        from sklearn.model_selection import cross_val_score
        from sklearn.feature_extraction.text import TfidfVectorizer
        from sklearn.linear_model import LogisticRegression
        from sklearn.pipeline import Pipeline
        from sklearn.metrics import make_scorer, f1_score, recall_score, precision_s
        def objective(trial):
            # Define the hyperparameters to search over
            C = trial.suggest_loguniform('C', 1e-5, 100)
            weight = trial.suggest_float('weight', 0.1, 0.9)
            class_weight = {0: 1 - weight, 1: weight}
            # Create a pipeline with the current set of hyperparameters
            classifier 1 = Pipeline([
                ('classifier', LogisticRegression(max_iter=10000, C=C, class_weight=
            1)
            # Use cross-validation to evaluate the classifier with the current hyper
            # Use fl_score as the scoring metric
            scores = cross val score(classifier 1, X train features, y train, cv=5,
            return scores.mean()
In [ ]: study = optuna.create_study(direction='maximize')
        study.optimize(objective, n_trials=100)
```

```
[I 2024-02-10 23:09:35,532] A new study created in memory with name: no-name
-d216896f-2a81-42d2-9fc9-e71672905b6a
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:35,643] Trial 0 finished with value: 0.7250793650793652
and parameters: {'C': 1.2698895339538292, 'weight': 0.7004355848270041}. Bes
t is trial 0 with value: 0.7250793650793652.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:35,945] Trial 1 finished with value: 0.707170868347339 a
nd parameters: {'C': 73.54192658056628, 'weight': 0.8097168708511949}. Best
is trial 0 with value: 0.7250793650793652.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,163] Trial 2 finished with value: 0.7432323232323232
and parameters: {'C': 32.47169983770629, 'weight': 0.5388257838837822}. Best
is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,204] Trial 3 finished with value: 0.0 and parameters:
{'C': 0.017681950834996442, 'weight': 0.26967468331629496}. Best is trial 2
with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,387] Trial 4 finished with value: 0.707170868347339 a
nd parameters: {'C': 79.57730772320078, 'weight': 0.7915662540022963}. Best
is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,412] Trial 5 finished with value: 0.5676750700280112
and parameters: {'C': 0.0001073115555023658, 'weight': 0.8316106486353115}.
Best is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,432] Trial 6 finished with value: 0.0 and parameters:
```

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{'C': 1.2189901116154918e-05, 'weight': 0.7701027423608839}. Best is trial 2
with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,497] Trial 7 finished with value: 0.44825396825396824
and parameters: {'C': 0.08377112654314088, 'weight': 0.3823796696875892}. Be
st is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,520] Trial 8 finished with value: 0.5125965537730244
and parameters: {'C': 0.0001322290108813281, 'weight': 0.8820255401501986}.
Best is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,539] Trial 9 finished with value: 0.0 and parameters:
{'C': 0.0001353759198802439, 'weight': 0.12782048504316937}. Best is trial 2
with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,663] Trial 10 finished with value: 0.7038672438672439
and parameters: {'C': 2.1365784791532576, 'weight': 0.577260858670628}. Best
is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,774] Trial 11 finished with value: 0.7038672438672439
and parameters: {'C': 1.7640438031619032, 'weight': 0.6090288365641059}. Bes
t is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,906] Trial 12 finished with value: 0.71555555555555555
and parameters: {'C': 3.312551586470135, 'weight': 0.6395638191235605}. Best
is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:36,966] Trial 13 finished with value: 0.391111111111111
```

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and parameters: {'C': 0.06590908041875267, 'weight': 0.438196137329576}. Bes
t is trial 2 with value: 0.7432323232323232.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,106] Trial 14 finished with value: 0.74666666666666666
and parameters: {'C': 8.807861832157677, 'weight': 0.6941143684200776}. Best
is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
and parameters: {'C': 17.205549392388992, 'weight': 0.5086411096130716}. Bes
t is trial 14 with value: 0.74666666666666.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,298] Trial 16 finished with value: 0.0 and parameter
s: {'C': 0.004988549849587719, 'weight': 0.3547812140538492}. Best is trial
14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,373] Trial 17 finished with value: 0.60878787878788
and parameters: {'C': 0.24592139730373908, 'weight': 0.5204934470079102}. Be
st is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,519] Trial 18 finished with value: 0.74666666666666666
and parameters: {'C': 18.80387053838522, 'weight': 0.6952234723972714}. Best
is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,670] Trial 19 finished with value: 0.746666666666666666
and parameters: {'C': 10.650471637671888, 'weight': 0.6866520152799251}. Bes
t is trial 14 with value: 0.7466666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,702] Trial 20 finished with value: 0.3864102564102564
```

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and parameters: {'C': 0.00353914846256371, 'weight': 0.7341108414732657}. Be
st is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,862] Trial 21 finished with value: 0.74666666666666666
and parameters: {'C': 9.840786544572053, 'weight': 0.682806428549798}. Best
is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:37,952] Trial 22 finished with value: 0.7184126984126984
and parameters: {'C': 0.3865791024359061, 'weight': 0.6588000707086615}. Bes
t is trial 14 with value: 0.74666666666666.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,098] Trial 23 finished with value: 0.74666666666666666
and parameters: {'C': 7.819363663638683, 'weight': 0.7254417907824084}. Best
is trial 14 with value: 0.746666666666666.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,170] Trial 24 finished with value: 0.7678635090399797
and parameters: {'C': 0.44186907958314264, 'weight': 0.8998435369174903}. Be
st is trial 24 with value: 0.7678635090399797.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
and parameters: {'C': 0.42211338450419544, 'weight': 0.6053896842372846}. Be
st is trial 24 with value: 0.7678635090399797.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,348] Trial 26 finished with value: 0.7497619047619047
and parameters: {'C': 0.811115196055809, 'weight': 0.8954595661519325}. Best
is trial 24 with value: 0.7678635090399797.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,434] Trial 27 finished with value: 0.7752164502164502
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and parameters: {'C': 0.6556305552340775, 'weight': 0.894567967232033}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,476] Trial 28 finished with value: 0.6841269841269841
and parameters: {'C': 0.02315621838139302, 'weight': 0.8865516960855486}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,568] Trial 29 finished with value: 0.7497619047619047
and parameters: {'C': 0.7973423812276681, 'weight': 0.8930518529828725}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,627] Trial 30 finished with value: 0.6677350427350428
and parameters: {'C': 0.11116388411357332, 'weight': 0.8285072225225196}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,716] Trial 31 finished with value: 0.7497619047619047
and parameters: {'C': 0.8439835633145456, 'weight': 0.8991651655305116}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,798] Trial 32 finished with value: 0.7497619047619047
and parameters: {'C': 0.5615566034792074, 'weight': 0.8508789850132672}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,869] Trial 33 finished with value: 0.6694017094017094
and parameters: {'C': 0.16363932765509814, 'weight': 0.7895073095174098}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:38,978] Trial 34 finished with value: 0.7376470588235294
```

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and parameters: {'C': 3.7231016623728417, 'weight': 0.8514264633403558}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,077] Trial 35 finished with value: 0.74666666666666666
and parameters: {'C': 1.105695048019481, 'weight': 0.7508016310532286}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,124] Trial 36 finished with value: 0.6658119658119659
and parameters: {'C': 0.0517424481293205, 'weight': 0.8076877014125564}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,156] Trial 37 finished with value: 0.5994079449961803
and parameters: {'C': 0.006077232714660474, 'weight': 0.8977087581040245}. B
est is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,227] Trial 38 finished with value: 0.7193589743589743
and parameters: {'C': 0.24046588597354523, 'weight': 0.8347324341008856}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,264] Trial 39 finished with value: 0.679040959040959
and parameters: {'C': 0.01186716578072559, 'weight': 0.7905817656239493}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,432] Trial 40 finished with value: 0.7289890501655207
and parameters: {'C': 42.07638063820315, 'weight': 0.8604511515950879}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,522] Trial 41 finished with value: 0.7497619047619047
```

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and parameters: {'C': 0.8924863981588053, 'weight': 0.8827777769761018}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,613] Trial 42 finished with value: 0.7497619047619047
and parameters: {'C': 0.813748360337159, 'weight': 0.898258828774492}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,738] Trial 43 finished with value: 0.74666666666666666
and parameters: {'C': 3.6477795067468506, 'weight': 0.7637413187892976}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,843] Trial 44 finished with value: 0.7309803921568627
and parameters: {'C': 1.6757664994041281, 'weight': 0.8098316265031011}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,871] Trial 45 finished with value: 0.5719974143503556
and parameters: {'C': 0.0014583698236369058, 'weight': 0.8548696786562457}.
Best is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,931] Trial 46 finished with value: 0.2071428571428571
3 and parameters: {'C': 0.1358310580098597, 'weight': 0.16653444855564903}.
Best is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:39,978] Trial 47 finished with value: 0.696923076923077
and parameters: {'C': 0.036169973181305985, 'weight': 0.8178138035180578}. B
est is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
```

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and parameters: {'C': 4.441120703282361, 'weight': 0.7767465613006116}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,206] Trial 49 finished with value: 0.60878787878788
and parameters: {'C': 0.4070227607228069, 'weight': 0.46314224273313515}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,315] Trial 50 finished with value: 0.7555957767722474
and parameters: {'C': 2.1083073918665267, 'weight': 0.8671216852248422}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,422] Trial 51 finished with value: 0.7424089635854342
and parameters: {'C': 1.8258122193059794, 'weight': 0.8745005147752163}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,502] Trial 52 finished with value: 0.7368831168831169
and parameters: {'C': 0.6826961774796504, 'weight': 0.8379995739414537}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,576] Trial 53 finished with value: 0.7623959373959375
and parameters: {'C': 0.2567209546295611, 'weight': 0.8667535847955972}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,644] Trial 54 finished with value: 0.7448135198135198
and parameters: {'C': 0.18153272099838458, 'weight': 0.8660126580495088}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,701] Trial 55 finished with value: 0.322222222222222
```

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4 and parameters: {'C': 0.0757904759540108, 'weight': 0.3112252928267345}. B
est is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,826] Trial 56 finished with value: 0.74666666666666666
and parameters: {'C': 2.0360778899455476, 'weight': 0.72876971792393}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,849] Trial 57 finished with value: 0.0 and parameter
s: {'C': 1.0562322073828433e-05, 'weight': 0.8117506476266939}. Best is tria
l 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:40,930] Trial 58 finished with value: 0.7122588522588522
and parameters: {'C': 0.28532720558084185, 'weight': 0.7661755395628524}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,074] Trial 59 finished with value: 0.7248265460030167
and parameters: {'C': 6.5143546664668355, 'weight': 0.860317809979239}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,221] Trial 60 finished with value: 0.6808547008547008
and parameters: {'C': 30.480318635472347, 'weight': 0.18953326280346106}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,313] Trial 61 finished with value: 0.7424089635854342
and parameters: {'C': 1.1046805367021209, 'weight': 0.8944589460571032}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,403] Trial 62 finished with value: 0.7368831168831169
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and parameters: {'C': 0.5731493510798207, 'weight': 0.8359395134231947}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,512] Trial 63 finished with value: 0.7555957767722474
and parameters: {'C': 2.507218613899659, 'weight': 0.8781274785368222}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,641] Trial 64 finished with value: 0.7376470588235294
and parameters: {'C': 3.1932932586905123, 'weight': 0.8632340638103801}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,798] Trial 65 finished with value: 0.71815987933635 a
nd parameters: {'C': 13.529565192257236, 'weight': 0.8005768443004464}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:41,931] Trial 66 finished with value: 0.71555555555555555
and parameters: {'C': 5.811400202390375, 'weight': 0.5680180020633667}. Best
is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,049] Trial 67 finished with value: 0.7237878787878789
and parameters: {'C': 2.7706849991591733, 'weight': 0.8347266651616855}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,148] Trial 68 finished with value: 0.7424089635854342
and parameters: {'C': 1.3910385438201567, 'weight': 0.8752539835964362}. Bes
t is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,226] Trial 69 finished with value: 0.7038672438672439
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and parameters: {'C': 0.31958327616163273, 'weight': 0.7417425804198008}. Be
st is trial 27 with value: 0.7752164502164502.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,283] Trial 70 finished with value: 0.7766788766788768
and parameters: {'C': 0.11789088736088514, 'weight': 0.8994338399383455}. Be
st is trial 70 with value: 0.7766788766788768.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,342] Trial 71 finished with value: 0.7590964590964591
and parameters: {'C': 0.10194573008985293, 'weight': 0.8989415249090094}. Be
st is trial 70 with value: 0.7766788766788768.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,390] Trial 72 finished with value: 0.721590174531351
and parameters: {'C': 0.04692897068953697, 'weight': 0.8769825707114746}. Be
st is trial 70 with value: 0.7766788766788768.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,453] Trial 73 finished with value: 0.7071794871794872
and parameters: {'C': 0.09638490621191978, 'weight': 0.8373442841557875}. Be
st is trial 70 with value: 0.7766788766788768.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,515] Trial 74 finished with value: 0.8015567765567766
and parameters: {'C': 0.22823093369924694, 'weight': 0.898850258395965}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,554] Trial 75 finished with value: 0.721590174531351
and parameters: {'C': 0.015437659241664677, 'weight': 0.8546245163248756}. B
est is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,629] Trial 76 finished with value: 0.682222222222222
```

```
and parameters: {'C': 0.20206049446973667, 'weight': 0.782852630526598}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,674] Trial 77 finished with value: 0.6881318681318682
and parameters: {'C': 0.024543176872862636, 'weight': 0.818745784861242}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,731] Trial 78 finished with value: 0.7634615384615385
and parameters: {'C': 0.11456943155048234, 'weight': 0.8768840817654752}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,791] Trial 79 finished with value: 0.7590964590964591
and parameters: {'C': 0.10881838330669075, 'weight': 0.8980868112055268}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,835] Trial 80 finished with value: 0.7421029950441715
and parameters: {'C': 0.06018558874723756, 'weight': 0.8991804913776913}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,894] Trial 81 finished with value: 0.7243006993006993
and parameters: {'C': 0.10969735587672809, 'weight': 0.8496694824302798}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:42,954] Trial 82 finished with value: 0.7448135198135198
and parameters: {'C': 0.15003616902220673, 'weight': 0.8727846157137441}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,040] Trial 83 finished with value: 0.7368831168831169
```

```
and parameters: {'C': 0.5191256042759169, 'weight': 0.815128977221544}. Best
is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,081] Trial 84 finished with value: 0.7163614163614163
and parameters: {'C': 0.03759749153278692, 'weight': 0.899177871497993}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,157] Trial 85 finished with value: 0.7405128205128205
and parameters: {'C': 0.3224336321395782, 'weight': 0.8452158622423492}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,210] Trial 86 finished with value: 0.7495726495726496
and parameters: {'C': 0.08085438064943651, 'weight': 0.87498850095674}. Best
is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,289] Trial 87 finished with value: 0.5771428571428572
and parameters: {'C': 0.19547875139518314, 'weight': 0.3865342021777778}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,326] Trial 88 finished with value: 0.6647552447552447
and parameters: {'C': 0.0098047424755794, 'weight': 0.8238951941463704}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,398] Trial 89 finished with value: 0.6828865578865579
and parameters: {'C': 0.13196720977405768, 'weight': 0.795718902929735}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,434] Trial 90 finished with value: 0.5581512605042017
```

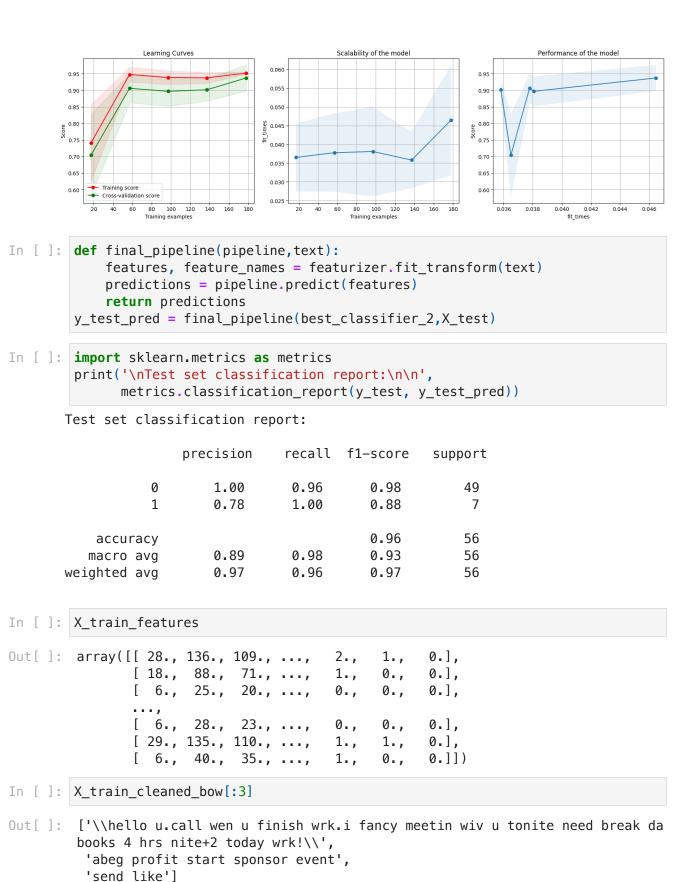
```
and parameters: {'C': 1.914059530847369e-05, 'weight': 0.8604706869678698}.
Best is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,605] Trial 91 finished with value: 0.7752164502164502
and parameters: {'C': 0.40245067098923704, 'weight': 0.8861013858642302}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,743] Trial 92 finished with value: 0.7678635090399797
and parameters: {'C': 0.44457080129413357, 'weight': 0.8823576855222646}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,871] Trial 93 finished with value: 0.7424089635854342
and parameters: {'C': 0.4706089677085482, 'weight': 0.8809060265224272}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:43,971] Trial 94 finished with value: 0.7405128205128205
and parameters: {'C': 0.2880586237472912, 'weight': 0.845525516759483}. Best
is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:44,076] Trial 95 finished with value: 0.7623959373959375
and parameters: {'C': 0.2096734282422439, 'weight': 0.8846768946642827}. Bes
t is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:44,249] Trial 96 finished with value: 0.7623959373959375
and parameters: {'C': 0.23971615046110692, 'weight': 0.8811925614554333}. Be
st is trial 74 with value: 0.8015567765567766.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:09:44,459] Trial 97 finished with value: 0.7623959373959375
```

```
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
       ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
         C = trial.suggest_loguniform('C', 1e-5, 100)
       [I 2024-02-10 23:09:44,637] Trial 98 finished with value: 0.7368831168831169
       and parameters: {'C': 0.4599770195462979, 'weight': 0.8280550761766343}. Bes
       t is trial 74 with value: 0.8015567765567766.
       /var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625.
       py:10: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
       feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
       ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
         C = trial.suggest loguniform('C', 1e-5, 100)
       [I 2024-02-10 23:09:44,822] Trial 99 finished with value: 0.758095238095238
       and parameters: {'C': 0.9438971888178072, 'weight': 0.8538186545544422}. Bes
       t is trial 74 with value: 0.8015567765567766.
In [ ]: # Get the best hyperparameters found by Optuna
        best_C = study.best_params['C']
        best weight = study.best params['weight']
In [ ]: study.best_params
Out[]: {'C': 0.22823093369924694, 'weight': 0.898850258395965}
In [ ]: study.best value
Out[]: 0.8015567765567766
In []: best classifier 2 = Pipeline([
            ('classifier', LogisticRegression(max_iter=10000, C=best_C,class_weight=
        ])
In [ ]: best_classifier_2.fit(X_train_features, y_train)
Out[]:
                  Pipeline
           ▶ LogisticRegression
In [ ]: plot_learning_curve(best_classifier_2, 'Learning Curves',
                            X_train_features, y_train, n_jobs=-1)
Out[]: <module 'matplotlib.pyplot' from '/opt/homebrew/anaconda3/envs/nlp/lib/pyth</pre>
        on3.11/site-packages/matplotlib/pyplot.py'>
```

and parameters: {'C': 0.23206692082672656, 'weight': 0.8826797793909361}. Be

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2325454625. py:10: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This

st is trial 74 with value: 0.8015567765567766.



In []: feature_names

```
Out[]: ['count_words',
           'count_characters',
           'count_characters_no_space',
           'avg_word_length',
           'count_numbers',
           'count_sentences',
           'spelling_errors',
           'noun_count',
           'aux_count',
           'verb_count',
           'adj_count',
           'ner']
In [ ]: X_train_features.shape
Out[]: (223, 12)
In [ ]: X_train_final = pd.concat((pd.DataFrame(X_train_cleaned_bow, columns=['clear'
                                       pd.DataFrame(X_train_features, columns=feature_na
In [ ]: X_train_final.head()
Out[]:
            cleaned_text count_words count_characters count_characters_no_space avg_wor
              \hello u.call
              wen u finish
         0
                                  28.0
                                                   136.0
                                                                                109.0
               wrk.i fancy
                meetin ...
               abeg profit
            start sponsor
                                   18.0
                                                    88.0
                                                                                 71.0
                   event
         2
                 send like
                                   6.0
                                                    25.0
                                                                                 20.0
             free ringtone
              wait collect
         3
                                  22.0
                                                    125.0
                                                                                104.0
               simply text
                passwor...
                   play w
                computer
         4
                                   9.0
                                                    37.0
                                                                                 29.0
             aiyah tok 2 u
                      lor
```

Sparse Embeddings (TF-IDF) + Feature Engineering

```
In []: from sklearn.base import TransformerMixin, BaseEstimator
    from scipy.sparse import csr_matrix
    class SparseTransformer(TransformerMixin, BaseEstimator):
        def __init__(self):
            pass
```

```
def fit(self, X, y=None):
                 return self
             def transform(self, X, y=None):
                 return csr_matrix(X)
In [ ]: sparse_features = Pipeline([('sparse', SparseTransformer()), ])
         vectorizer = Pipeline([('tfidf', TfidfVectorizer(max_features=5)), ])
In [ ]: from sklearn.compose import ColumnTransformer
         combined_features = ColumnTransformer(
             transformers=[
                 ('tfidf', vectorizer, 'cleaned_text'),
             ], remainder=sparse_features
         )
In [ ]: test = combined features.fit transform(X train final[0:10])
In [ ]: test[:5]
Out[]: array([[
                                  0.
                                                 0.
                                                                0.
                                             , 136.
                    1.
                                 28.
                                                              109.
                    3.75862069,
                                  1.
                                                 2.
                                                               12.
                    0.
                                   3.
                                                 2.
                                                                1.
                    0.
                 [
                   0.
                                  0.
                                                 0.
                                                                0.
                    0.
                                 18.
                                                88.
                                                               71.
                    3.73684211,
                                  0.
                                                 3.
                                                                4.
                                   3.
                                                 1.
                                                                0.
                    0.
                 0.
                                                                0.
                                   0.
                                                 1.
                                                25.
                    0.
                                  6.
                                                               20.
                    2.85714286,
                                                 2.
                                  0.
                                                                0.
                    1.
                                   2.
                                                 0.
                                                                0.
                    0.
                 [
                   0.
                                  0.
                                                 0.
                                                                0.
                    0.
                                 22.
                                             , 125.
                                                            , 104.
                    4.52173913,
                                  1.
                                                 4.
                                                                5.
                    2.
                                   5.
                                                 2.
                                                                3.
                              ],
                   0.
                                   0.
                                                 0.
                                                                0.
                    0.
                                  9.
                                                37.
                                                               29.
                    2.9
                                   1.
                                                 2.
                                                                5.
                    0.
                                   2.
                                                 0.
                                                                1.
                              11)
                    0.
In [ ]: classifier_3 = Pipeline([('combined_features', combined_features),
                                   ('classifier', LogisticRegression(max_iter=10000)),
                                   1)
         classifier_3.get_params().keys()
```

```
Out[]: dict_keys(['memory', 'steps', 'verbose', 'combined_features', 'classifier',
         'combined_features__n_jobs', 'combined_features__remainder__memory', 'combi
        ned_features__remainder__steps', 'combined_features__remainder__verbose',
         'combined_features__remainder__sparse', 'combined_features__remainder', 'co
        mbined_features__sparse_threshold', 'combined_features__transformer_weight
         s', 'combined_features__transformers', 'combined_features__verbose', 'combi
         ned_features__verbose_feature_names_out', 'combined_features__tfidf', 'comb
         ined_features__tfidf__memory', 'combined_features__tfidf__steps', 'combined
         _features__tfidf__verbose', 'combined_features__tfidf__tfidf', 'combined_fe
        atures__tfidf__tfidf__analyzer', 'combined_features__tfidf__tfidf__binary',
'combined_features__tfidf__tfidf__decode_error', 'combined_features__tfidf__
         _tfidf__dtype', 'combined_features__tfidf__tfidf__encoding', 'combined_feat
         ures__tfidf__tfidf__input', 'combined_features__tfidf__tfidf__lowercase',
         'combined_features__tfidf__tfidf__max_df', 'combined_features__tfidf__tfidf
         __max_features', 'combined_features__tfidf__tfidf__min_df', 'combined_featu
         res__tfidf__tfidf__ngram_range', 'combined_features__tfidf__tfidf__norm',
         'combined_features__tfidf__tfidf__preprocessor', 'combined_features__tfidf_
        _tfidf__smooth_idf', 'combined_features__tfidf__tfidf__stop_words', 'combin
        ed_features__tfidf__tfidf__strip_accents', 'combined_features__tfidf__tfidf
         __sublinear_tf', 'combined_features__tfidf__tfidf__token_pattern', 'combine
        d_features__tfidf__tfidf__tokenizer', 'combined_features__tfidf__tfidf__use
        _idf', 'combined_features__tfidf__tfidf__vocabulary', 'classifier__C', 'cla
         ssifier__class_weight', 'classifier__dual', 'classifier__fit_intercept', 'c
        lassifier__intercept_scaling', 'classifier__l1_ratio', 'classifier__max_ite
        r', 'classifier__multi_class', 'classifier__n_jobs', 'classifier__penalty',
         'classifier__random_state', 'classifier__solver', 'classifier__tol', 'class
         ifier__verbose', 'classifier__warm_start'])
In [ ]: import optuna
        from sklearn.compose import ColumnTransformer
        from sklearn.pipeline import Pipeline
        from sklearn.model_selection import cross_val_score
        from sklearn.metrics import make_scorer, f1_score
        from sklearn.feature_extraction.text import TfidfVectorizer
        from sklearn.linear_model import LogisticRegression
        def objective(trial):
            # Define the hyperparameters to search over
            C = trial.suggest_loguniform('C', 1e-5, 100)
            combined_features__tfidf__tfidf__max_features = trial.suggest_int('combi
            weight = trial.suggest_float('weight', 0.1, 0.9)
            class_weight = {0: 1 - weight, 1: weight}
            # Use cross-validation to evaluate the classifier with the current hyper
            # Use fl_score as the scoring metric
            scores = cross_val_score(classifier_3, X_train_final, y_train, cv=5, sco
            return scores.mean()
In [ ]: study = optuna.create_study(direction='maximize')
```

study.optimize(objective, n_trials=100)

```
[I 2024-02-10 23:10:40,644] A new study created in memory with name: no-name
-3cba03ab-4ef1-4dd0-86ea-0ae4395eb55e
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:40,982] Trial 0 finished with value: 0.6572005772005772
and parameters: {'C': 76.47970923231102, 'combined_features__tfidf__tfidf__m
ax features': 9871, 'weight': 0.4134389756478075}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:41,212] Trial 1 finished with value: 0.6572005772005772
and parameters: {'C': 0.3094480648021479, 'combined_features__tfidf__tfidf__
max_features': 5648, 'weight': 0.48243079892808416}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:41,549] Trial 2 finished with value: 0.6572005772005772
and parameters: {'C': 42.5640967487999, 'combined_features__tfidf__tfidf__ma
x_{\text{features}}: 912, 'weight': 0.47064828312705254}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:41,767] Trial 3 finished with value: 0.6572005772005772
and parameters: {'C': 0.0009101691317151461, 'combined_features__tfidf__tfid
f__max_features': 8735, 'weight': 0.7289717795734393}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:41,942] Trial 4 finished with value: 0.6572005772005772
and parameters: {'C': 0.5048311665943958, 'combined_features__tfidf__tfidf__
max_features': 3453, 'weight': 0.7375870456042034}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,116] Trial 5 finished with value: 0.6572005772005772
and parameters: {'C': 0.0013405411143846998, 'combined_features__tfidf__tfid
f__max_features': 319, 'weight': 0.6341542496083217}. Best is trial 0 with v
```

alue: 0.6572005772005772.

```
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,290] Trial 6 finished with value: 0.6572005772005772
and parameters: {'C': 0.015129511824048132, 'combined features tfidf tfidf
__max_features': 1090, 'weight': 0.28361379231486505}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,464] Trial 7 finished with value: 0.6572005772005772
and parameters: {'C': 0.39401961754923437, 'combined_features__tfidf__tfidf_
_max_features': 8866, 'weight': 0.18591812429295365}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,641] Trial 8 finished with value: 0.6572005772005772
and parameters: {'C': 0.004256388602195834, 'combined_features__tfidf__tfidf
__max_features': 5022, 'weight': 0.31085521910171987}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,816] Trial 9 finished with value: 0.6572005772005772
and parameters: {'C': 0.0003455043717988141, 'combined_features__tfidf__tfid
f__max_features': 9201, 'weight': 0.7227508389965656}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:42,999] Trial 10 finished with value: 0.6572005772005772
and parameters: {'C': 1.4819378262719582e-05, 'combined_features__tfidf__tfi
df__max_features': 6876, 'weight': 0.12310816488378862}. Best is trial 0 wit
h value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:43,197] Trial 11 finished with value: 0.6572005772005772
```

and parameters: {'C': 79.31445939470296, 'combined_features__tfidf__tfidf__m ax_features': 6848, 'weight': 0.4992979512357216}. Best is trial 0 with value

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369. py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This

e: 0.6572005772005772.

```
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:43,435] Trial 12 finished with value: 0.6572005772005772
and parameters: {'C': 2.4274176829909937, 'combined_features__tfidf__tfidf__
max features': 3406, 'weight': 0.39554057051436375}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:43,636] Trial 13 finished with value: 0.6572005772005772
and parameters: {'C': 3.267679506919434, 'combined_features__tfidf__tfidf__m
ax features': 7222, 'weight': 0.8759793536918492}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:43,842] Trial 14 finished with value: 0.6572005772005772
and parameters: {'C': 0.08538528634961864, 'combined_features__tfidf__tfidf_
_max_features': 5039, 'weight': 0.5910445927647041}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:44,039] Trial 15 finished with value: 0.6572005772005772
and parameters: {'C': 7.250880109866882, 'combined_features__tfidf__tfidf__m
ax_features': 9899, 'weight': 0.3041485587643137}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:44,223] Trial 16 finished with value: 0.6572005772005772
and parameters: {'C': 0.08059348340835655, 'combined_features__tfidf__tfidf_
_max_features': 3012, 'weight': 0.4360017244484589}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:44,428] Trial 17 finished with value: 0.6572005772005772
and parameters: {'C': 16.055457851871978, 'combined features tfidf tfidf
max_features': 8088, 'weight': 0.5764773414229761}. Best is trial 0 with val
```

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369. py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.

ue: 0.6572005772005772.

```
C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:44,755] Trial 18 finished with value: 0.6572005772005772
and parameters: {'C': 0.8890325859903189, 'combined features tfidf tfidf
max_features': 5948, 'weight': 0.4010725787078958}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:45,210] Trial 19 finished with value: 0.6572005772005772
and parameters: {'C': 6.81532998479793e-05, 'combined features tfidf tfidf
__max_features': 2291, 'weight': 0.5342735643971656}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:45,486] Trial 20 finished with value: 0.6572005772005772
and parameters: {'C': 0.015601310489999833, 'combined_features__tfidf__tfidf
__max_features': 4144, 'weight': 0.36030028899064437}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:45,669] Trial 21 finished with value: 0.6572005772005772
and parameters: {'C': 49.45893988913405, 'combined_features__tfidf__tfidf__m
ax features': 1891, 'weight': 0.44215457352210663}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:45,853] Trial 22 finished with value: 0.6572005772005772
and parameters: {'C': 12.044346400300931, 'combined_features__tfidf__tfidf__
max_features': 5623, 'weight': 0.4806408611391752}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:46,037] Trial 23 finished with value: 0.6572005772005772
and parameters: {'C': 93.1799835988889, 'combined_features__tfidf__tfidf__ma
x_features': 7624, 'weight': 0.21788322480869343}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:46,222] Trial 24 finished with value: 0.6572005772005772
```

```
and parameters: {'C': 25.695679200866646, 'combined_features__tfidf__tfidf_
max_features': 399, 'weight': 0.6409471290252666}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:46,416] Trial 25 finished with value: 0.6572005772005772
and parameters: {'C': 2.4305982138052196, 'combined_features__tfidf__tfidf__
max_features': 1588, 'weight': 0.5152762713503379}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:46,624] Trial 26 finished with value: 0.6572005772005772
and parameters: {'C': 0.09074607579983494, 'combined_features__tfidf__tfidf_
_max_features': 6336, 'weight': 0.37409422842397755}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:46,878] Trial 27 finished with value: 0.6572005772005772
and parameters: {'C': 6.842634787777967, 'combined_features__tfidf__tfidf__m
ax_features': 9957, 'weight': 0.44941810957744555}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:47,082] Trial 28 finished with value: 0.6572005772005772
and parameters: {'C': 1.1688983961270834, 'combined_features__tfidf__tfidf_
max features': 4020, 'weight': 0.573482278479546}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:47,283] Trial 29 finished with value: 0.6572005772005772
and parameters: {'C': 0.20034647476405365, 'combined_features__tfidf__tfidf_
_max_features': 8290, 'weight': 0.6985967381160909}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
```

C = trial.suggest_loguniform('C', 1e-5, 100) [I 2024-02-10 23:10:47,472] Trial 30 finished with value: 0.6572005772005772 and parameters: {'C': 32.667194594746455, 'combined_features__tfidf__tfidf__ max_features': 4432, 'weight': 0.8648934596841376}. Best is trial 0 with val

```
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:47,658] Trial 31 finished with value: 0.6572005772005772
and parameters: {'C': 0.001386189707523588, 'combined_features__tfidf__tfidf
max features': 9067, 'weight': 0.7958215955299448}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:47,845] Trial 32 finished with value: 0.6572005772005772
and parameters: {'C': 0.00024148389249978118, 'combined_features__tfidf__tfi
df__max_features': 8411, 'weight': 0.6537949190968537}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,034] Trial 33 finished with value: 0.6572005772005772
and parameters: {'C': 0.002188792328341339, 'combined features tfidf tfidf
__max_features': 2636, 'weight': 0.33658128101774426}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,225] Trial 34 finished with value: 0.6572005772005772
and parameters: {'C': 0.014810343812142548, 'combined_features__tfidf__tfidf
__max_features': 9544, 'weight': 0.7859137312763795}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,413] Trial 35 finished with value: 0.6572005772005772
and parameters: {'C': 0.006908480025438169, 'combined features tfidf tfidf
__max_features': 7527, 'weight': 0.24458414394258937}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,599] Trial 36 finished with value: 0.6572005772005772
and parameters: {'C': 0.00036913186703487703, 'combined_features__tfidf__tfi
df__max_features': 8696, 'weight': 0.5495220868378115}. Best is trial 0 with
value: 0.6572005772005772.
```

/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.

```
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,786] Trial 37 finished with value: 0.6572005772005772
and parameters: {'C': 0.3500112352413946, 'combined_features__tfidf__tfidf__
max features': 5569, 'weight': 0.4803034023347197}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:48,983] Trial 38 finished with value: 0.6572005772005772
and parameters: {'C': 4.33578759233745e-05, 'combined features tfidf tfidf
__max_features': 1202, 'weight': 0.6144597519664805}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:49,187] Trial 39 finished with value: 0.6572005772005772
and parameters: {'C': 0.0007917406607789709, 'combined_features__tfidf__tfid
f__max_features': 9387, 'weight': 0.4094162356724139}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:49,376] Trial 40 finished with value: 0.6572005772005772
and parameters: {'C': 3.9022845827059673, 'combined_features__tfidf__tfidf__
max_features': 6769, 'weight': 0.2659518201945127}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:49,562] Trial 41 finished with value: 0.6572005772005772
and parameters: {'C': 0.974453325984537, 'combined_features__tfidf__tfidf__m
ax_features': 3202, 'weight': 0.7504905761162045}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:49,747] Trial 42 finished with value: 0.6572005772005772
and parameters: {'C': 0.033365930619195724, 'combined_features__tfidf__tfidf
__max_features': 492, 'weight': 0.6819139666233253}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
```

py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele

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ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:49,933] Trial 43 finished with value: 0.6572005772005772
and parameters: {'C': 0.24188552462431331, 'combined_features__tfidf__tfidf_
_max_features': 3739, 'weight': 0.8135719997720285}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:50,120] Trial 44 finished with value: 0.6572005772005772
and parameters: {'C': 0.7088633893641536, 'combined_features__tfidf__tfidf__
max_features': 4413, 'weight': 0.1052186541606504}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:50,306] Trial 45 finished with value: 0.6572005772005772
and parameters: {'C': 16.578394201891143, 'combined features tfidf tfidf
max_features': 900, 'weight': 0.4732079791813707}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:50,492] Trial 46 finished with value: 0.6572005772005772
and parameters: {'C': 1.020973241033354e-05, 'combined features tfidf tfid
f__max_features': 4748, 'weight': 0.7403645655724543}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:50,678] Trial 47 finished with value: 0.6572005772005772
and parameters: {'C': 0.03556288716334406, 'combined_features__tfidf__tfidf_
_max_features': 2549, 'weight': 0.8468999888468334}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:50,865] Trial 48 finished with value: 0.6572005772005772
and parameters: {'C': 43.68771603446479, 'combined_features__tfidf__tfidf__m
ax features': 8875, 'weight': 0.8951669459132047}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
```

```
[I 2024-02-10 23:10:51,053] Trial 49 finished with value: 0.6572005772005772
and parameters: {'C': 7.649438606835259, 'combined_features__tfidf__tfidf__m
ax features': 3535, 'weight': 0.3282365179445851}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:51,240] Trial 50 finished with value: 0.6572005772005772
and parameters: {'C': 0.08307129354541283, 'combined_features__tfidf__tfidf_
max features': 7872, 'weight': 0.5386293006315266}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:51,427] Trial 51 finished with value: 0.6572005772005772
and parameters: {'C': 0.006718238337593601, 'combined_features__tfidf__tfidf
__max_features': 884, 'weight': 0.6200338070206304}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:51,614] Trial 52 finished with value: 0.6572005772005772
and parameters: {'C': 8.77495922315535e-05, 'combined_features__tfidf__tfidf
__max_features': 1609, 'weight': 0.6922419465935041}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:51,803] Trial 53 finished with value: 0.6572005772005772
and parameters: {'C': 0.0026448403213161524, 'combined features tfidf tfid
f__max_features': 355, 'weight': 0.7564654876668299}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:51,991] Trial 54 finished with value: 0.6572005772005772
and parameters: {'C': 94.55459462234806, 'combined_features__tfidf__tfidf__m
ax_features': 2025, 'weight': 0.4221893295882221}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
```

[I 2024-02-10 23:10:52,178] Trial 55 finished with value: 0.6572005772005772 and parameters: {'C': 0.000809356222752913, 'combined_features__tfidf__tfidf

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__max_features': 1442, 'weight': 0.5066727018601639}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:52,369] Trial 56 finished with value: 0.6572005772005772
and parameters: {'C': 0.015477536373345573, 'combined features tfidf tfidf
__max_features': 5551, 'weight': 0.7243885964818463}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:52,558] Trial 57 finished with value: 0.6572005772005772
and parameters: {'C': 1.8657526904548392, 'combined_features__tfidf__tfidf__
max_features': 138, 'weight': 0.658903501092373}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:52,745] Trial 58 finished with value: 0.6572005772005772
and parameters: {'C': 0.0002522329293516432, 'combined_features__tfidf__tfid
f max features': 6568, 'weight': 0.3856973473496643}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:52,943] Trial 59 finished with value: 0.6572005772005772
and parameters: {'C': 0.4899896470847121, 'combined_features__tfidf__tfidf__
max features': 2914, 'weight': 0.5627479239064019}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:53,131] Trial 60 finished with value: 0.6572005772005772
and parameters: {'C': 59.86145721668611, 'combined_features__tfidf__tfidf__m
ax_features': 7185, 'weight': 0.5859829883471652}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:53,319] Trial 61 finished with value: 0.6572005772005772
and parameters: {'C': 0.14617395413487086, 'combined_features__tfidf_tfidf_
_max_features': 849, 'weight': 0.3505492251881324}. Best is trial 0 with val
ue: 0.6572005772005772.
```

```
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:53,506] Trial 62 finished with value: 0.6572005772005772
and parameters: {'C': 0.0044914231171358085, 'combined_features__tfidf__tfid
f__max_features': 9616, 'weight': 0.18575518230934213}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:53,694] Trial 63 finished with value: 0.6572005772005772
and parameters: {'C': 0.046078231317813044, 'combined_features__tfidf__tfidf
__max_features': 2108, 'weight': 0.29197330238703423}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:53,883] Trial 64 finished with value: 0.6572005772005772
and parameters: {'C': 20.238302299543857, 'combined_features__tfidf__tfidf__
max_features': 1262, 'weight': 0.45660783888341816}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:54,072] Trial 65 finished with value: 0.6572005772005772
and parameters: {'C': 0.0005596226760116509, 'combined features tfidf tfid
f__max_features': 6053, 'weight': 0.1786959436226736}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:54,261] Trial 66 finished with value: 0.6572005772005772
and parameters: {'C': 4.285595042745302, 'combined_features__tfidf__tfidf__m
ax_features': 636, 'weight': 0.7103247181855981}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
```

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This

alue: 0.6572005772005772.

[I 2024-02-10 23:10:54,449] Trial 67 finished with value: 0.6572005772005772 and parameters: {'C': 0.001908028179743875, 'combined_features__tfidf__tfidf__max_features': 5227, 'weight': 0.7756358287389675}. Best is trial 0 with v

```
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:54,637] Trial 68 finished with value: 0.6572005772005772
and parameters: {'C': 0.00011725443828027734, 'combined_features__tfidf__tfi
df_max_features': 1750, 'weight': 0.5134454388759381}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:54,832] Trial 69 finished with value: 0.6572005772005772
and parameters: {'C': 0.022286892465973065, 'combined_features__tfidf__tfidf
max features': 172, 'weight': 0.6021506042398183}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:55,021] Trial 70 finished with value: 0.6572005772005772
and parameters: {'C': 0.007640073393689825, 'combined_features__tfidf__tfidf
__max_features': 9729, 'weight': 0.4338470520900403}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:55,210] Trial 71 finished with value: 0.6572005772005772
and parameters: {'C': 0.16638511626853372, 'combined features tfidf tfidf
_max_features': 9144, 'weight': 0.13797407716698953}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:55,398] Trial 72 finished with value: 0.6572005772005772
and parameters: {'C': 9.80062569437644, 'combined_features__tfidf__tfidf__ma
x_{features}: 8100, 'weight': 0.269518040750531}. Best is trial 0 with value:
0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:55,591] Trial 73 finished with value: 0.6572005772005772
and parameters: {'C': 0.33368995275684965, 'combined features tfidf tfidf
_max_features': 8608, 'weight': 0.2176163132125391}. Best is trial 0 with va
```

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369. py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.

lue: 0.6572005772005772.

```
C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:55,825] Trial 74 finished with value: 0.6572005772005772
and parameters: {'C': 1.5679109292191287, 'combined features tfidf tfidf
max_features': 9301, 'weight': 0.8287125594820199}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:56,044] Trial 75 finished with value: 0.6572005772005772
and parameters: {'C': 0.0547988457960963, 'combined_features__tfidf__tfidf__
max_features': 9899, 'weight': 0.15889539402801217}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:56,309] Trial 76 finished with value: 0.6572005772005772
and parameters: {'C': 0.00127180485873453, 'combined_features__tfidf__tfidf_
max features': 1169, 'weight': 0.49569178705846145}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:56,530] Trial 77 finished with value: 0.6572005772005772
and parameters: {'C': 0.7133829820993266, 'combined_features__tfidf__tfidf__
max features': 8886, 'weight': 0.6725693368047536}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:56,744] Trial 78 finished with value: 0.6572005772005772
and parameters: {'C': 38.19296400244871, 'combined_features__tfidf__tfidf__m
ax_features': 7737, 'weight': 0.4575036225507767}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:57,106] Trial 79 finished with value: 0.6572005772005772
and parameters: {'C': 0.0037467384465955334, 'combined_features__tfidf__tfid
f__max_features': 2342, 'weight': 0.22757198966982928}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:57,450] Trial 80 finished with value: 0.6572005772005772
```

```
and parameters: {'C': 57.31749222650803, 'combined_features__tfidf__tfidf__m
ax_features': 7223, 'weight': 0.3779693099728163}. Best is trial 0 with valu
e: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:57,749] Trial 81 finished with value: 0.6572005772005772
and parameters: {'C': 0.01234565400888515, 'combined_features__tfidf__tfidf_
_max_features': 4714, 'weight': 0.3092219573542836}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:58,259] Trial 82 finished with value: 0.6572005772005772
and parameters: {'C': 0.00962707125031314, 'combined_features__tfidf__tfidf_
_max_features': 6207, 'weight': 0.3547497409221916}. Best is trial 0 with va
lue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:58,506] Trial 83 finished with value: 0.6572005772005772
and parameters: {'C': 0.023332896478947075, 'combined_features__tfidf__tfidf
__max_features': 3997, 'weight': 0.4007162133988631}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:58,744] Trial 84 finished with value: 0.6572005772005772
and parameters: {'C': 0.004828728695549009, 'combined_features__tfidf__tfidf
max features': 3750, 'weight': 0.2782535884902792}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:59,044] Trial 85 finished with value: 0.6572005772005772
and parameters: {'C': 0.0010569021827521127, 'combined_features__tfidf__tfid
f__max_features': 726, 'weight': 0.6385267165265592}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
```

[I 2024-02-10 23:10:59,291] Trial 86 finished with value: 0.6572005772005772 and parameters: {'C': 0.0028704722439946875, 'combined_features__tfidf__tfidf__max_features': 8265, 'weight': 0.24076523265131905}. Best is trial 0 with

```
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:59,491] Trial 87 finished with value: 0.6572005772005772
and parameters: {'C': 2.6374285623378606, 'combined_features__tfidf__tfidf__
max features': 3034, 'weight': 0.5353441169378801}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:10:59,687] Trial 88 finished with value: 0.6572005772005772
and parameters: {'C': 0.12432934581892463, 'combined_features__tfidf__tfidf_
_max_features': 5259, 'weight': 0.42782896590822883}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:00,061] Trial 89 finished with value: 0.6572005772005772
and parameters: {'C': 0.00037952096606708597, 'combined features tfidf tfi
df__max_features': 1144, 'weight': 0.333018580771118}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:00,338] Trial 90 finished with value: 0.6572005772005772
and parameters: {'C': 0.002008934607836569, 'combined_features__tfidf__tfidf
__max_features': 4285, 'weight': 0.20096836362513976}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:00,574] Trial 91 finished with value: 0.6572005772005772
and parameters: {'C': 0.00015743481911524576, 'combined features tfidf tfi
df__max_features': 9993, 'weight': 0.7275800628491494}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:00,809] Trial 92 finished with value: 0.6572005772005772
and parameters: {'C': 4.275895724892047e-05, 'combined_features__tfidf__tfid
f__max_features': 9506, 'weight': 0.7537166550111732}. Best is trial 0 with
value: 0.6572005772005772.
```

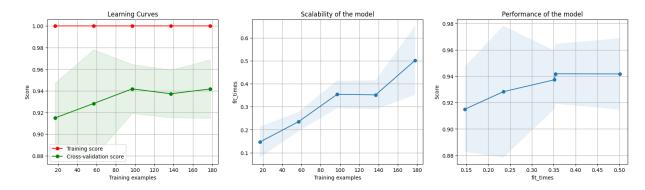
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.

```
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,006] Trial 93 finished with value: 0.6572005772005772
and parameters: {'C': 0.0006955453786124017, 'combined_features__tfidf__tfid
f_max_features': 8528, 'weight': 0.8002862160585938}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415q31bq07yrkc5qbm0000qn/T/ipykernel 77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,196] Trial 94 finished with value: 0.6572005772005772
and parameters: {'C': 0.00044769912847917914, 'combined features tfidf tfi
df max features': 8942, 'weight': 0.775562006173428}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,388] Trial 95 finished with value: 0.6572005772005772
and parameters: {'C': 22.99125371481944, 'combined_features__tfidf__tfidf__m
ax_features': 9301, 'weight': 0.48202561698268104}. Best is trial 0 with val
ue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,579] Trial 96 finished with value: 0.6572005772005772
and parameters: {'C': 0.00025022964590722986, 'combined_features__tfidf__tfi
df max features': 5714, 'weight': 0.7132086911677757}. Best is trial 0 with
value: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,771] Trial 97 finished with value: 0.6572005772005772
and parameters: {'C': 0.0011786497680906433, 'combined_features__tfidf__tfid
f__max_features': 376, 'weight': 0.3089982412858477}. Best is trial 0 with v
alue: 0.6572005772005772.
/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369.
py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This
feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele
ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.
  C = trial.suggest_loguniform('C', 1e-5, 100)
[I 2024-02-10 23:11:01,963] Trial 98 finished with value: 0.6572005772005772
and parameters: {'C': 0.47490997204165686, 'combined_features__tfidf__tfidf_
_max_features': 4782, 'weight': 0.5246910910436595}. Best is trial 0 with va
lue: 0.6572005772005772.
```

/var/folders/3d/fk1zpy415g31bg07yrkc5qbm0000gn/T/ipykernel_77497/2587201369. py:11: FutureWarning: suggest_loguniform has been deprecated in v3.0.0. This feature will be removed in v6.0.0. See https://github.com/optuna/optuna/rele

```
C = trial.suggest_loguniform('C', 1e-5, 100)
       [I 2024-02-10 23:11:02,154] Trial 99 finished with value: 0.6572005772005772
       and parameters: {'C': 0.2312309022110591, 'combined_features__tfidf__tfidf__
       max_features': 9054, 'weight': 0.410879946250452}. Best is trial 0 with valu
       e: 0.6572005772005772.
In [ ]: study.best_params
Out[]: {'C': 76.47970923231102,
         'combined_features__tfidf__tfidf__max_features': 9871,
         'weight': 0.4134389756478075}
In [ ]: study.best_value
Out[]: 0.6572005772005772
In []: # Get the best hyperparameters found by Optuna
        best_max_features = study.best_params['combined_features__tfidf__tfidf__max_
        best C = study.best params['C']
        best_weight = study.best_params['weight']
In [ ]: best_classifier_3 = Pipeline([('combined_features',
                                      ColumnTransformer( transformers=[('tfidf',
                                                                        TfidfVector
                                                        remainder=sparse_features))
                                      ('classifier', LogisticRegression(max_iter=100
                                                                       class weight
In [ ]: best_classifier_3.fit(X_train_final, y_train)
Out[]:
                                Pipeline
                   combined_features: ColumnTransformer
                      tfidf
                                         remainder
             TfidfVectorizer
                                          ▶ SparseTransformer
                          LogisticRegression
In [ ]: # plot learning curces
        plot_learning_curve(best_classifier_3, 'Learning Curves',
                           X_train_final, y_train, n_jobs=-1)
Out[]: <module 'matplotlib.pyplot' from '/opt/homebrew/anaconda3/envs/nlp/lib/pyth
        on3.11/site-packages/matplotlib/pyplot.py'>
```

ases/tag/v3.0.0. Use suggest_float(..., log=True) instead.



Test set classification report:

	precision	recall	f1-score	support
0 1	0.98 1.00	1.00 0.86	0.99 0.92	49 7
accuracy macro avg weighted avg	0.99 0.98	0.93 0.98	0.98 0.96 0.98	56 56 56