

Phase 2: Innovation

Introduction to Sentiment Analysis for Marketing

In today's digitally-driven world, where information flows rapidly across various online platforms, businesses and marketers are faced with an unprecedented volume of data. This data not only comprises factual information but also includes valuable insights into consumer opinions, emotions, and sentiments. Harnessing this wealth of sentiment data is crucial for marketers seeking to understand their audience, improve brand perception, and make data-driven decisions that can impact their marketing strategies positively.



Sentiment analysis, also known as opinion mining, is a powerful analytical technique that plays a pivotal role in this endeavor. It involves the automated process of extracting and quantifying sentiments expressed in text data, allowing marketers to gain valuable insights into the feelings and attitudes of their customers and prospects. By delving into sentiment analysis, marketers can unlock a treasure trove of information that goes beyond mere likes, shares, and comments, providing a deeper understanding of consumer sentiment.

1. Model Selection:

- ☐ *In this phase, you will conduct comprehensive research to choose a pre-trained sentiment analysis model that aligns with your project requirements and available resources. Some popular options include BERT, RoBERTa, GPT, and others. Consider factors like model size, computational resources, and the specific sentiment analysis task you're addressing.*

2. Data Preparation:

Proper data preparation is crucial for training a successful sentiment analysis model. You should:

- ☐ *Ensure your dataset is correctly formatted, including labels (positive, negative, neutral) and text data.*
- ☐ *Split your dataset into training, validation, and test sets to train, fine-tune, and evaluate your model effectively.*
- ☐ *Tokenize and preprocess the text data according to the requirements of your chosen pre-trained model. Preprocessing may involve lowercasing, removing punctuation, and applying tokenization.*

3. Model Fine-Tuning:

Fine-tuning involves training the selected pre-trained model on your specific dataset. This step helps adapt the model to your domain and improve its sentiment prediction accuracy.

You will:

- ☐ ***Load the pre-trained model.***
- ☐ ***Add a classification layer on top.***
- ☐ ***Train the model using your training dataset.***
- ☐ ***Monitor training progress and evaluate the model's performance on the validation set.***

4. Hyperparameter Tuning:

Experiment with various hyperparameters to optimize your model's performance. Key hyperparameters to consider include:

- ☐ ***Learning rate: Adjust the learning rate to control the size of weight updates during training.***
- ☐ ***Batch size: Modify the batch size to balance training speed and memory usage.***
- ☐ ***Number of epochs: Determine the optimal number of training epochs based on the validation performance.***

5.Evaluation:

- ☐ ***Evaluate your fine-tuned model using appropriate evaluation metrics, such as accuracy, precision, recall, and F1-score. These metrics will help you assess the model's effectiveness in predicting sentiment.***

- ☐ *If the initial model performance is unsatisfactory, consider revisiting the hyperparameter tuning and fine-tuning steps to improve results.*

6. Test the Model:

- ☐ *Ensure that your model generalizes well to unseen data by testing it on a separate test dataset. This step provides a final assessment of your model's performance and its ability to handle real-world data.*

7. Visualization:

Create visualizations to aid in understanding your model's predictions.

Visualizations could include:

- ☐ *Confusion matrices to visualize classification performance.*
- ☐ *ROC curves and precision-recall curves to assess model thresholds.*
- ☐ *Word clouds or attention heatmaps to highlight important features or tokens.*
- ☐ *Comparative plots of predicted sentiment distributions.*

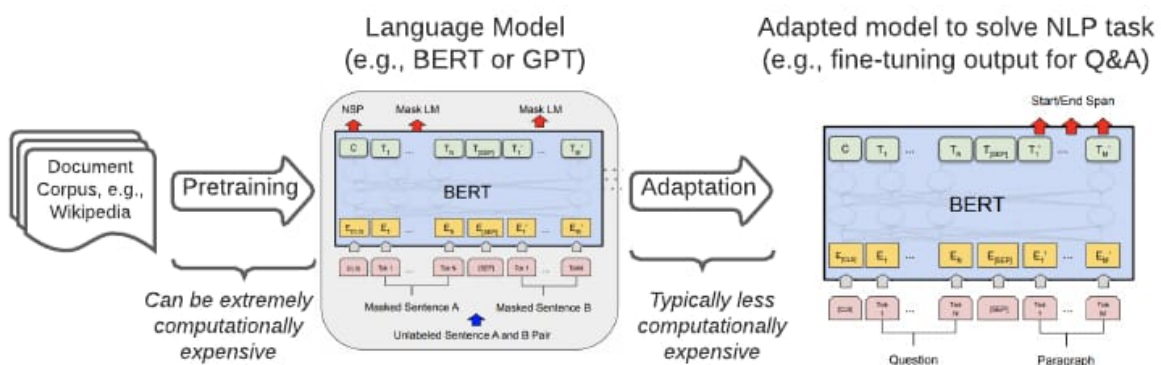
Some Advanced Techniques

BERT (Bidirectional Encoder Representations from Transformers):

BERT is a pre-trained deep learning model introduced by Google in 2018. It is designed to understand the context and semantics of words in a sentence by considering both left and right context simultaneously. This bidirectional understanding of text is a significant departure from earlier models that typically focused on either left-to-right or right-to-left language modeling.

Key features of BERT:

- ☐ ***Bidirectional Context***
- ☐ ***Transformer Architecture***
- ☐ ***Pre-training and Fine-Tuning***
- ☐ ***State-of-the-Art Results***

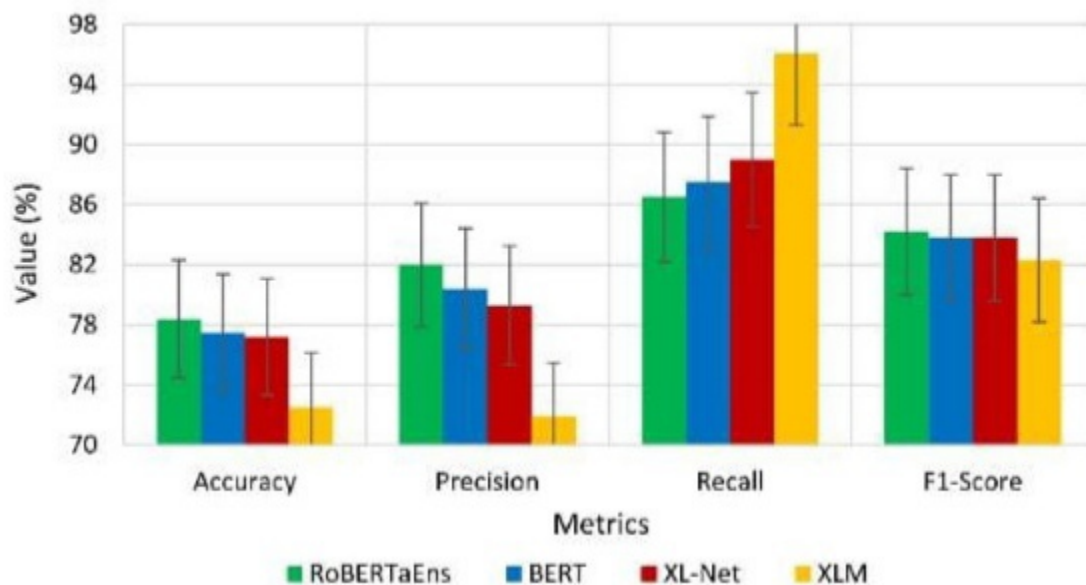


RoBERTa (A Robustly Optimized BERT Pretraining Approach):

RoBERTa, introduced by Facebook AI in 2019, can be thought of as an extension and optimization of the BERT model. It aims to improve upon BERT's performance by addressing some of its limitations.

Key features of RoBERTa:

- ☐ ***Large-Scale Training***
- ☐ ***Dynamically Masked Data***
- ☐ ***Training Variant***
- ☐ ***Improved Results***



Program :

```
[2]: df_train = pd.read_csv('C:\Users\11\Tweets.csv')
(df_train.shape)
```

 $(14640, 15)$

```
[2]:
```

	tweet_id	airline_sentiment	airline_sentiment_confidence
0	570306133677760513	neutral	1.0000
1	570301130888122368	positive	0.3486
2	570301083672813571	neutral	0.6837
3	570301031407624196	negative	1.0000
4	570300817074462722	negative	1.0000

	negativereason	negativereason_confidence	airline \
0	NaN	NaN	Virgin America
1	NaN	0.0000	Virgin America
2	NaN	NaN	Virgin America
3	Bad Flight	0.7033	Virgin America
4	Can't Tell	1.0000	Virgin America

airline_sentiment_gold name negativereason_gold

retweet_count \

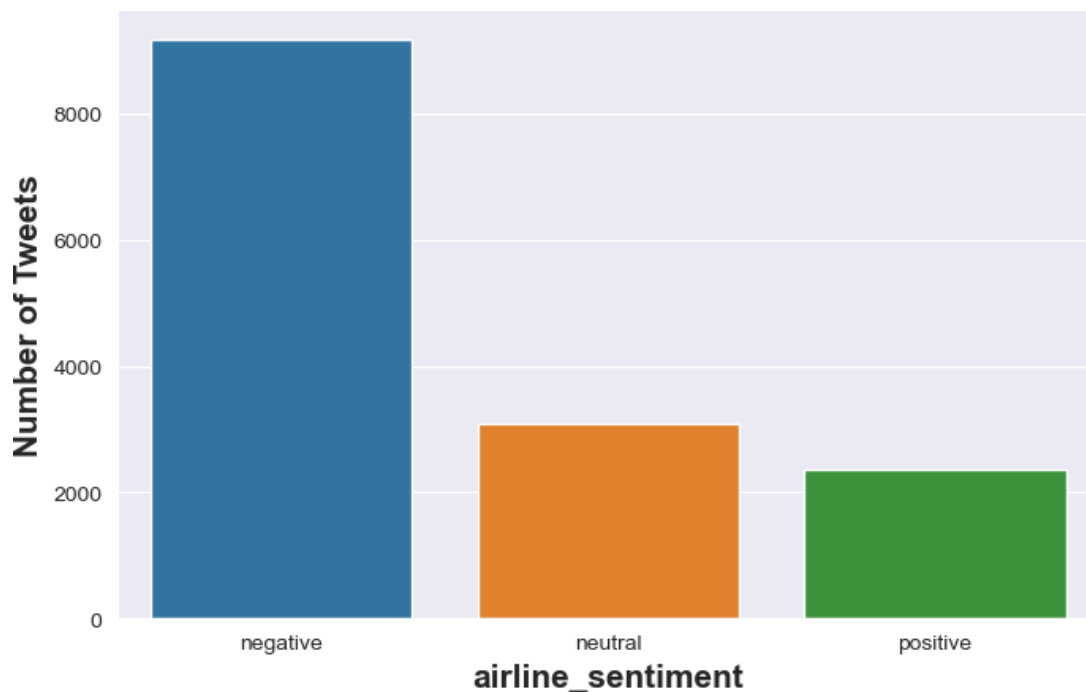
0	NaN	cairdin	NaN	0
1	NaN	jnardino	NaN	0
2	NaN	yvonnalyn	NaN	0
		n		
3	NaN	jnardino	NaN	0
4	NaN	jnardino	NaN	0

	text	tweet_coord \
0	@VirginAmerica What @dhepburn said.	NaN
1	@VirginAmerica plus you've added commercials t...	NaN
2	@VirginAmerica I didn't today... Must mean I n...	NaN
3	@VirginAmerica it's really aggressive to blast...	NaN
4	@VirginAmerica and it's a really big bad thing...	NaN

	tweet_created	tweet_location
	11:35:52 -0800	user_timezone 0 2015-02-24
		NaN Eastern Time (US & Canada)
1	2015-02-24 11:15:59 -0800	NaN Pacific Time (US & Canada)
2	2015-02-24 11:15:48 -0800	Lets Play Central Time (US & Canada)
3	2015-02-24 11:15:36 -0800	NaN Pacific Time (US & Canada)

```
[3]: plt.figure(figsize=(8,5))

temp = df_train['airline_sentiment'].value_counts()
sns.barplot(x=temp.index, y=temp.values) plt.xlabel("airline_sentiment",
weight='bold', fontsize=15) plt.ylabel("Number of Tweets",
weight='bold', fontsize=15) plt.show()
```




```
[4]: df_test=pd.read_csv("C:\\Users\\Tweets.csv")print
(df_test.shape)

df_test.head()
```

(14640, 15)

```
[4]:          tweet_id airline_sentiment  airline_sentiment_confidence \
0  570306133677760513      neutral      1.0000
1  570301130888122368    positive      0.3486
2  570301083672813571      neutral      0.6837
3  570301031407624196    negative      1.0000
4  570300817074462722    negative      1.0000
```

```
      negativereason  negativereason_confidence      airline \
0          NaN          NaN  Virgin America
1          NaN      0.0000  Virgin America
2          NaN          NaN  Virgin America
3    Bad Flight      0.7033  Virgin America
4    Can't Tell      1.0000  Virgin America
```

```
      airline_sentiment_gold      name negativereason_gold
0          NaN      cairdin          NaN      0
1  retweet_count \  NaN      jnardino          NaN      0
2          NaN  yvonnalyn          NaN      0
3          NaN      jnardino          NaN      0
```

```
          text tweet_coord \
0    @VirginAmerica What @dhepburn said.      NaN
1    @VirginAmerica plus you've added commercials t...      NaN
2    @VirginAmerica I didn't today... Must mean I n...      NaN
3    @VirginAmerica it's really aggressive to blast...      NaN
4    @VirginAmerica and it's a really big bad thing...      NaN
```

```
          tweet_created      tweet_location
11:35:52 -0800      user_timezone 0  2015-02-24
NaN Eastern Time (US &
Canada)
1  2015-02-24 11:15:59 -0800      NaN Pacific Time (US & Canada)
2  2015-02-24 11:15:48 -0800    Lets Play Central Time (US &
Canada)3  2015-02-24 11:15:36 -0800NaN Pacific Time (US &
Canada)4  2015-02-24 11:14:45 -0800NaN Pacific Time (US &
Canada)
```

```
[5]: from sklearn.model_selection import train_test_split
```

```
X = df_train.text.values
```

```
y = df_train.airline_sentiment.values
```

```
X_train, X_val, y_train, y_val = \
```

```
[6]: # Keep important columns
```

```
test_data = df_test[['tweet_id', 'text']]
```

```
[6]:
```

	tweet_id	text
11093	568512284202438656	@USAirways Your gate team are polite. But your...
13626	569790444797865984	@AmericanAir Hi. I have KOA-LAX-PHL-ORD booked...
6820	570232616755929088	@JetBlue glad you like it. Feel free to steal it.
5089	569355826248474624	@SouthwestAir Your hold music needs 2 be fixed...
10464	569277477652172800	@USAirways had to Cancelled Flight 4 of my fli...

```
[7]: import torch
```

```
if torch.cuda.is_available():
    device =
    torch.device("cuda")
    print(f'There are {torch.cuda.device_count()} GPU(s) available.')
    print('Device name:', torch.cuda.get_device_name(0))

else:
    print('No GPU available, using the CPU instead.')
    device = torch.device("cpu")
```

No GPU available, using the CPU instead.

```
[8]: import nltk
```

```
# Uncomment to download "stopwords"
```

```
nltk.download("stopwords")
from nltk.corpus import stopwords
```

```
def
```

```
    text_preprocessing(s)
```

```
    :s = s.lower()
    # Change 't to 'not'
```

```
    s = re.sub(r"\t", " not", s)
    # Remove @name
```

```

# Remove stopwords except 'not' and 'can'

s = " ".join([word for word in s.split()
               if word not in stopwords.words('english')
               or word in ['not', 'can']])

# Remove trailing whitespace

```

[nltk_data] Error loading stopwords: <urlopen error [Errno 11001][nltk_data]getaddrinfo failed>

```

[9]: from sklearn.feature_extraction.text import TfidfVectorizer

# Preprocess text

X_train_preprocessed = np.array([text_preprocessing(text) for text in X_train])
X_val_preprocessed = np.array([text_preprocessing(text) for text in X_val])

# Calculate TF-IDF

tf_idf = TfidfVectorizer(ngram_range=(1, 3),
                        binary=True, smooth_idf=False)

```

```

[10]: from sklearn.model_selection import StratifiedKFold, cross_val_score

def get_auc_CV(model):

    # Set KFold to shuffle data before the split

    kf = StratifiedKFold(5, shuffle=True, random_state=1)

    # Get AUC scores

    auc = cross_val_score(
        model, X_train_tfidf, y_train, scoring="roc_auc", cv=kf)

```

In [11]:

```
from sklearn.naive_bayes import MultinomialNB

res = pd.Series([get_auc_CV(MultinomialNB(i))
                  for i in np.arange(1, 10, 0.1)],
                index=np.arange(1, 10, 0.1))

best_alpha = np.round(res.idxmax(), 2)
print('Best alpha: ', best_alpha)

plt.plot(res)
plt.title('AUC vs. Alpha')
plt.xlabel('Alpha')
plt.ylabel('AUC')
plt.show()
```

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=1.0 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=1.1 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=1.2000000000000002 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=1.3000000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.4000000000000004 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.5000000000000004 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.6000000000000005 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.7000000000000006 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.8000000000000007 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=1.9000000000000008 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=2.0000000000000001 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
alpha=2.1000000000000001 as keyword args. From version 0.25 passing these as positional arguments will
result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass
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FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.40000000000000012 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.50000000000000013 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.60000000000000014 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.70000000000000015 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.80000000000000016 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=2.90000000000000017 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.00000000000000018 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.1000000000000002 as keyword args. From version 0.25 passing these as positional arguments will result in an error

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/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.60000000000000023 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.70000000000000024 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.80000000000000025 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=3.90000000000000026 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.000000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.100000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.200000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.3000000000000025 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.400000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.5000000000000036 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.600000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

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/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=4.700000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

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FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=5.00000000000000036 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=5.1000000000000003 as keyword args. From version 0.25 passing these as positional arguments will result in an error

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FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validat3-ion.py:70: FutureWarning: Pass alpha=6.1000000000000005 as keyword args. From version 0.25 passing these as positional arguments will result in an error

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/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=7.5000000000000005 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=7.6000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=7.7000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=7.8000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=7.9000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.0000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.1000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.2000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.3000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.4000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.5000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.6000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.7000000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.8000000000000008 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=8.9000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.0000000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.100000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.200000000000006 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.300000000000008 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.400000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.500000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.600000000000009 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.700000000000008 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.800000000000008 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

/opt/conda/lib/python3.7/site-packages/sklearn/utils/validation.py:70: FutureWarning: Pass alpha=9.900000000000007 as keyword args. From version 0.25 passing these as positional arguments will result in an error

FutureWarning)

