V.E.S. INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

NAME OF LAB TEACHER: Dr. (Mrs.) Anjali Yeole

Toxic Comments Classifier

- Surabhi Tambe- 59
- Subrato Tapaswi- 60
- Abhishek Thorat- 61

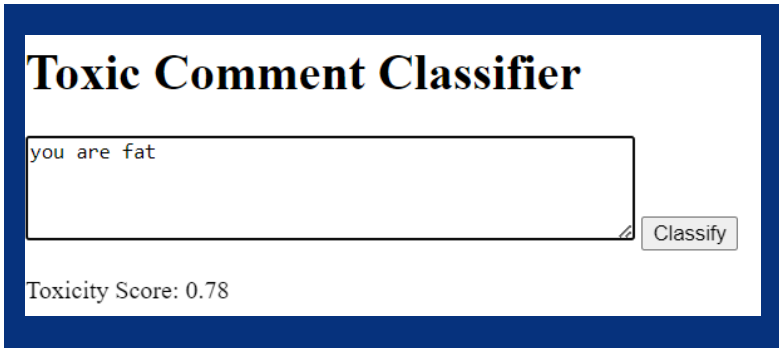
INTRODUCTION

In the realm of Natural Language Processing (NLP), toxic comment classification holds significant importance, as it addresses the critical task of identifying and flagging potentially harmful or offensive comments in online environments.

The model aims to identify a toxic comment by giving a “toxicity score” to the comments

PROBLEM STATEMENT

- Develop a robust toxic comment classification model in Python.
- Automatically identify and categorize offensive, harmful, or inappropriate content in user-generated comments.
- Enhance online community safety by implementing a machine learning solution.
- Filter and flag toxic comments in real-time.

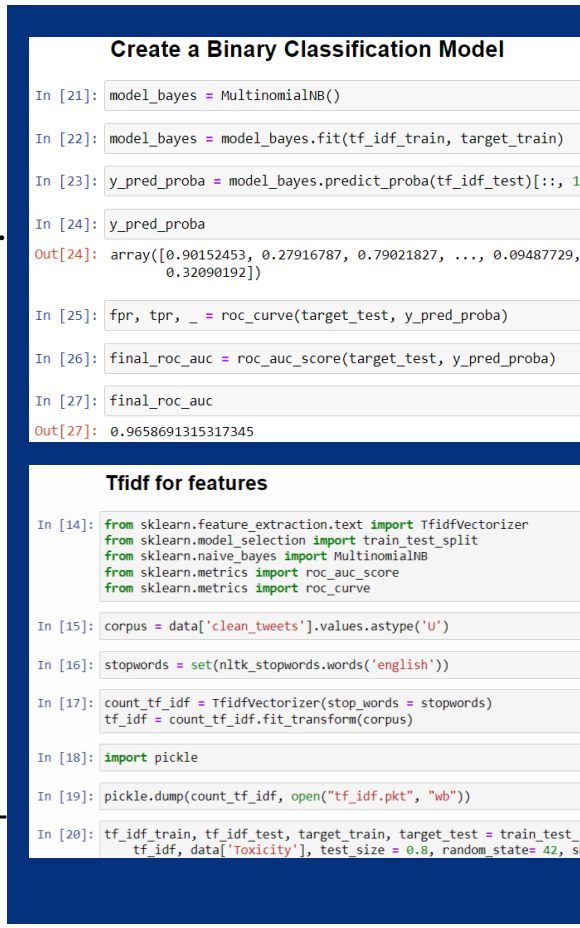


DATASET

- We found this dataset of 54,313 unique tweets on **Kaggle.**
- A concise, balanced dataset using Tweets containing hate speech and offensive language to help build sentiment analysis/toxicity detection models.
- This dataset combines various original datasets to address class imbalance, preserving data integrity, and achieving a balanced class distribution for improved analysis and modeling.

Working of the Model

- **TF-IDF Vectorization:**
  - Convert text to numerical features using TF-IDF.
  - Save TF-IDF vectorizer for future use.
- **Split Data:** Divide the dataset into training and testing sets.
- **Model Creation:**
  - Build a Multinomial Naive Bayes model.
  - Train the model with TF-IDF vectors.
- **Model Evaluation:** Assess model performance with ROC AUC score.
- **Classification Testing:** Test the model on sample toxic comments and display predictions.
- **Model Persistence:** Save the trained model and TF-IDF vectorizer for future applications.

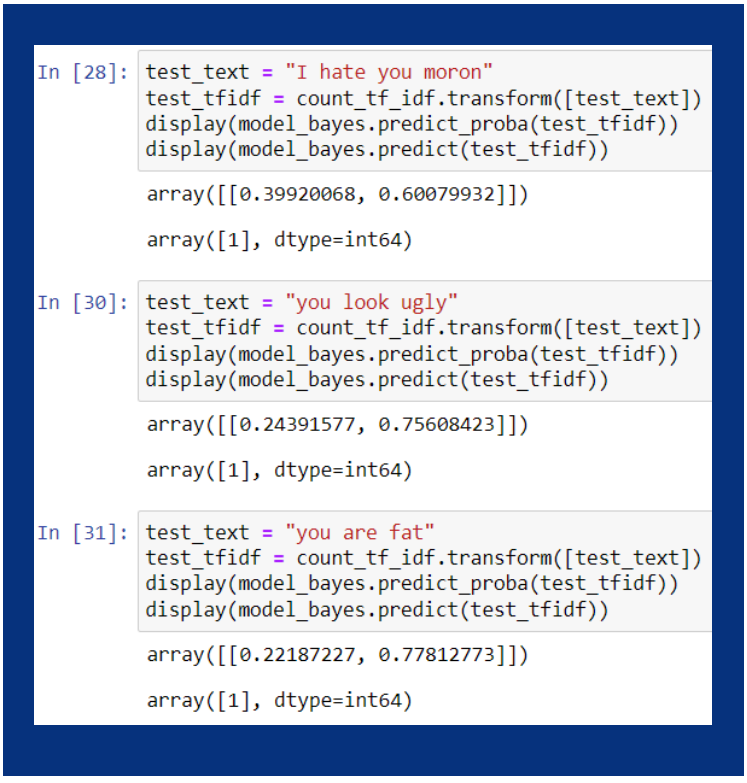


Create a Binary Classification Model

```
In [21]: model_bayes = MultinomialNB()

In [22]: model_bayes = model_bayes.fit(tf_idf_train, target_train)

In [23]: y_pred_proba = model_bayes.predict_proba(tf_idf_test)[::, 1

In [24]: y_pred_proba
Out[24]: array([0.90152453, 0.27916787, 0.79021827, ..., 0.09487729,
                0.32090192])

In [25]: fpr, tpr, _ = roc_curve(target_test, y_pred_proba)

In [26]: final_roc_auc = roc_auc_score(target_test, y_pred_proba)

In [27]: final_roc_auc
Out[27]: 0.9658691315317345
```

Tfidf for features

```
In [14]: from sklearn.feature_extraction.text import TfidfVectorizer
         from sklearn.model_selection import train_test_split
         from sklearn.naive_bayes import MultinomialNB
         from sklearn.metrics import roc_auc_score
         from sklearn.metrics import roc_curve

In [15]: corpus = data['clean_tweets'].values.astype('U')

In [16]: stopwords = set(nltk_stopwords.words('english'))

In [17]: count_tf_idf = TfidfVectorizer(stop_words = stopwords)
         tf_idf = count_tf_idf.fit_transform(corpus)

In [18]: import pickle

In [19]: pickle.dump(count_tf_idf, open("tf_idf.pkt", "wb"))

In [20]: tf_idf_train, tf_idf_test, target_train, target_test = train_test_
             tf_idf, data['Toxicity'], test_size = 0.8, random_state= 42, s
```



```
In [28]: test_text = "I hate you moron"
         test_tfidf = count_tf_idf.transform([test_text])
         display(model_bayes.predict_proba(test_tfidf))
         display(model_bayes.predict(test_tfidf))

         array([[0.39920068, 0.60079932]])

         array([1], dtype=int64)

In [30]: test_text = "you look ugly"
         test_tfidf = count_tf_idf.transform([test_text])
         display(model_bayes.predict_proba(test_tfidf))
         display(model_bayes.predict(test_tfidf))

         array([[0.24391577, 0.75608423]])

         array([1], dtype=int64)

In [31]: test_text = "you are fat"
         test_tfidf = count_tf_idf.transform([test_text])
         display(model_bayes.predict_proba(test_tfidf))
         display(model_bayes.predict(test_tfidf))

         array([[0.22187227, 0.77812773]])

         array([1], dtype=int64)
```

CONCLUSION

- A final ROC AUC score of 0.9659 indicates that the model performs exceptionally well in distinguishing between toxic and non-toxic comments.
- This high score demonstrates the model's robustness and effectiveness in classifying toxic language, making it a valuable tool for content moderation and online safety efforts.

THANK YOU

SIMPLE FRONTEND

- We have created a simple frontend using basic **HTML** and **JavaScript.**
- We have integrated our model using **Flask.**
- The website has a “**comment**” area, in which the user can type any text, and upon clicking the “**classify**” button, it will give the “**toxicity**” score for it.