Classification Model to distinguish posts from r/science and r/nature

By: Lin Junyuan

TABLE OF CONTENTS

Problem Statement

What is the

best classification model

that is able to identify whether a post belongs to the r/science subreddit or the r/nature subreddit with

at least 80% accuracy

and what are the

top 5 features?

Data Gathering and EDA

01

r/science

- 625 posts
- Set as 1 during encoding

02

r/nature

- 550 posts
- Set as 0 during encoding

- Baseline model:
- A post has 53% of being from r/science.

- Extracted and merged [‘title’] and [‘selftext’] into a single column [‘post’]

Pre-processing and Modelling

01

Preprocessor

Lemmatizer
PorterStemmer

02

Transformer

Count Vectorizor
TF-IDF Vectorizor

03

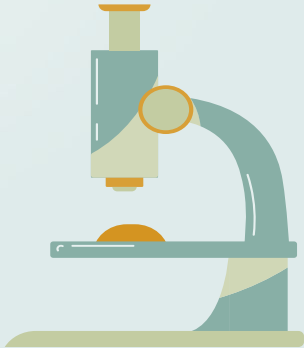
Model

Logistic Regression
Naive Bayes (MultinomialNB)

Model Evaluation

Pre_processing	Transformer	Model	Train_data_score	Test_data_score	Score_change
lemma	cvec	logr	0.9898	0.8265	-0.1633
lemma	cvec	nb	0.9648	0.8401	-0.1247
lemma	tvec	logr	1.0000	0.8163	-0.1837
lemma	tvec	nb	0.9716	0.8639	-0.1077
stem	cvec	logr	1.0000	0.8095	-0.1905
stem	cvec	nb	0.9580	0.8401	-0.1179
stem	tvec	logr	0.9977	0.8401	-0.1576
stem	tvec	nb	0.9773	0.8537	-0.1236

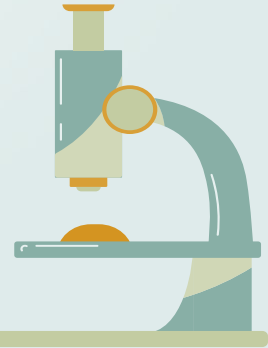
- All models show signs of overfitting due to high score on training data.
- Models with lower drop in score when tested with test data are marked with



Model Evaluation

Pre_processing	Transformer	Model	ROC_AUC_score
lemma	cvec	logr	0.906
lemma	cvec	nb	0.925
lemma	tvec	logr	0.902
lemma	tvec	nb	0.924
stem	cvec	logr	0.902
stem	cvec	nb	0.931
stem	tvec	logr	0.916
stem	tvec	nb	0.931

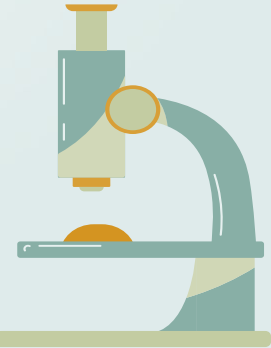
- All models have high ROC_AUC_scores
- Models with higher ROC_AUC_scores are marked with



Model Evaluation

Pre_processing	Transformer	Model	Accuracy	Sensitivity	Specificity	Precision
lemma	cvec	logr	0.83	0.83	0.83	0.84
lemma	cvec	nb	0.84	0.88	0.79	0.83
lemma	tvec	logr	0.82	0.87	0.76	0.80
lemma	tvec	nb	0.86	0.90	0.83	0.85
stem	cvec	logr	0.81	0.82	0.80	0.82
stem	cvec	nb	0.84	0.90	0.77	0.82
stem	tvec	logr	0.84	0.92	0.75	0.81
stem	tvec	nb	0.85	0.92	0.78	0.83

- Accuracy is chosen as the main metric.
- Models with higher Accuracy are marked with

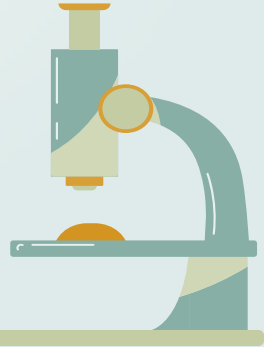


Model Evaluation

Pre_processing	Transformer	Model	ROC_AUC_score	Score_change	Accuracy
lemma	cvec	logr	0.906	-0.1633	0.83
lemma	cvec	nb	0.925	-0.1247	0.84
lemma	tvec	logr	0.902	-0.1837	0.82
lemma	tvec	nb	0.924	-0.1077	0.86
stem	cvec	logr	0.902	-0.1905	0.81
stem	cvec	nb	0.931	-0.1179	0.84
stem	tvec	logr	0.916	-0.1576	0.84
stem	tvec	nb	0.931	-0.1236	0.85

lemma/tvec/nb model chosen due to:

- Slightly higher accuracy
- Lower drop in score change
- Lemmatized words are more meaningful



Top 5 features of selected model

01 Study

02 Covid

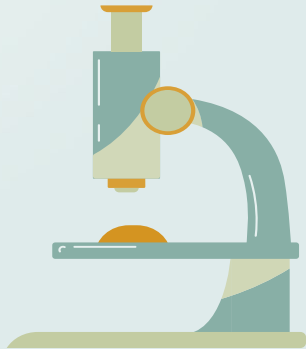
03 New

04 Researcher

05 People

Model Evaluation

- Tested selected model on unseen data
- Extracted another 100 posts from each subreddit and ran predictions
- Model was able to score 86% accuracy



Conclusion

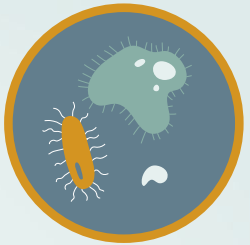
- Lemmatization -
  TF-IDF Vectorizer -
  Naive Bayes MultinomialNB

  model found to be best suited to the problem statement.

- Top 5 features are
  - Study
  - Covid
  - New
  - Researcher
  - People

Recommendations

- Due to ‘Covid’ being one of the top features, it indicates that model is picking up certain time-sensitive terms.
    - Can be mitigated by building up training data over a period of time and reinforce the model



- High tendency of overfitting to training data
    - Modify GridSearch to look for parameters that lead to least drop in score when testing model on test data

THANKS