PROJECT 3: SUBREDDIT NLP ANALYSIS

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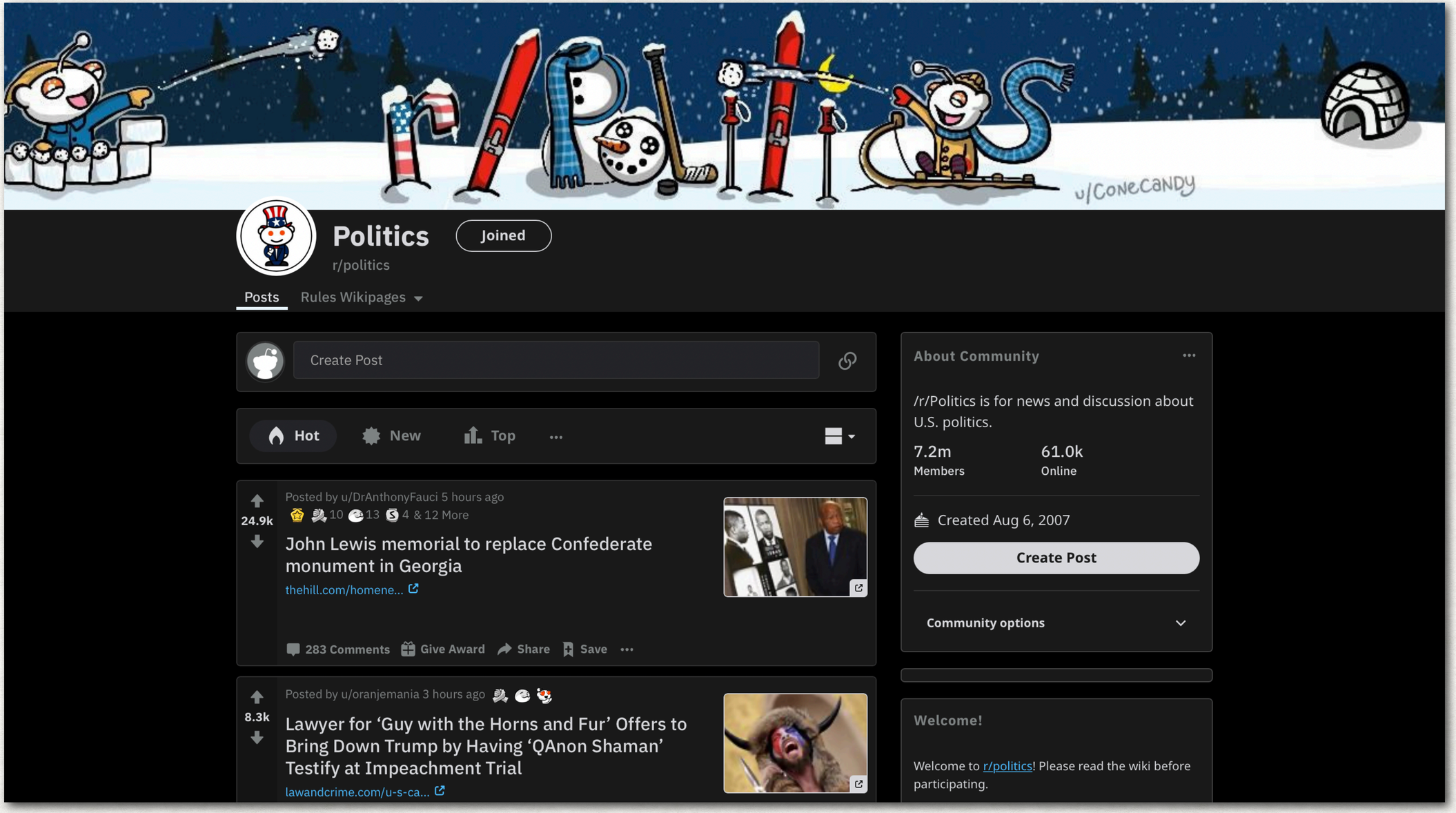
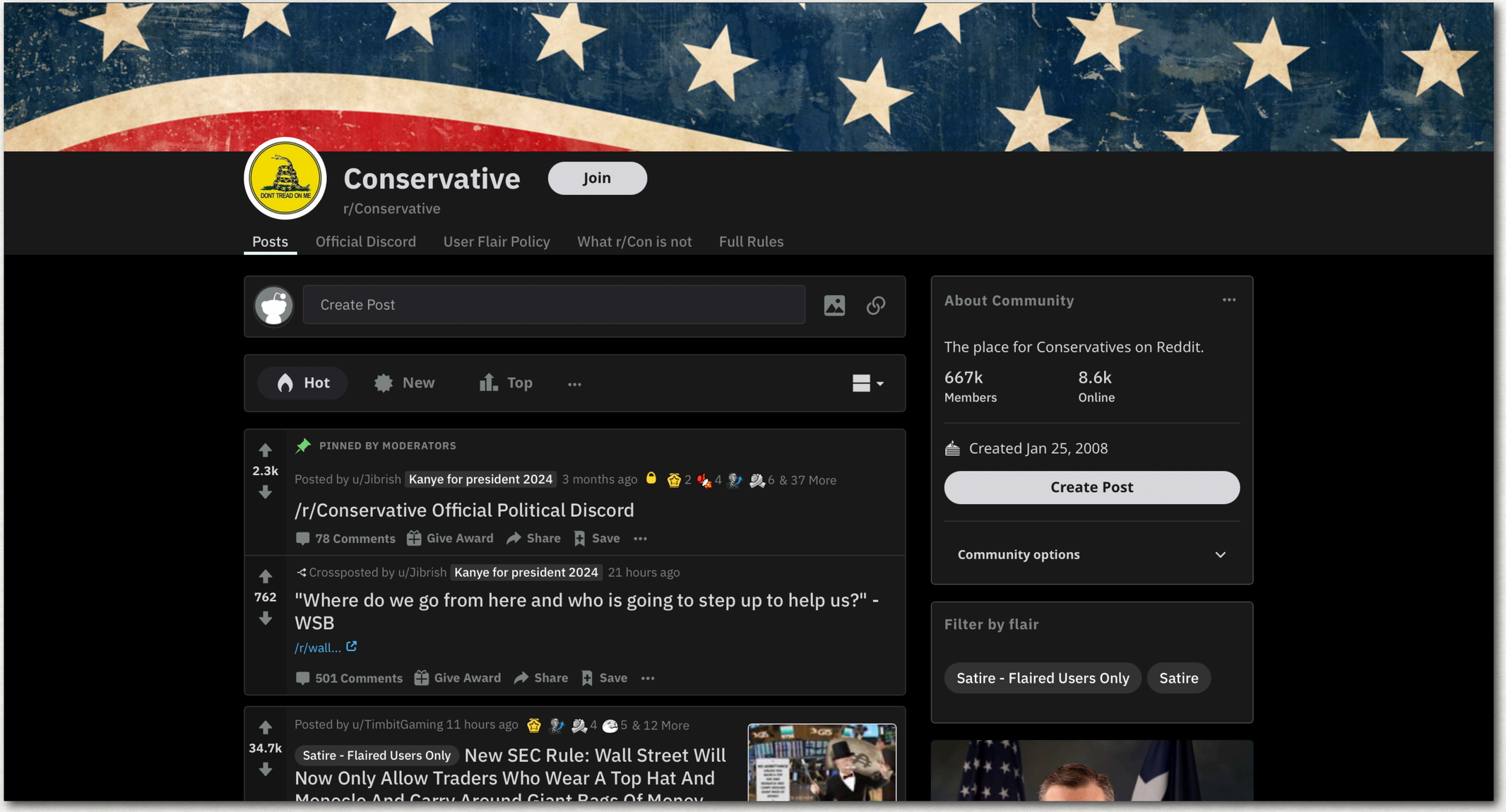
PROBLEM STATEMENT

- Using two subreddits based on U.S. politics, this project aims to use NLP to predict whether or not a news headline was published by a conservative-leaning or liberal-leaning news source. The two subreddits selected represent both sides of the political spectrum, but cover (roughly) the same news topics. This analysis hopes to understand the relationship between the words used in a headline and the political leaning of its source.

THE SUBREDDITS



THE SUBREDDITS



THE DATA

r/Politics

3. Post titles must be the exact headline from the article.

Full rule here.

A title must be comprised only of the copied and pasted headline of the article.

Do not add, remove, or change words.

r/Conservative

6. Title not from article

Submission headlines must match the article headline or quote the article.

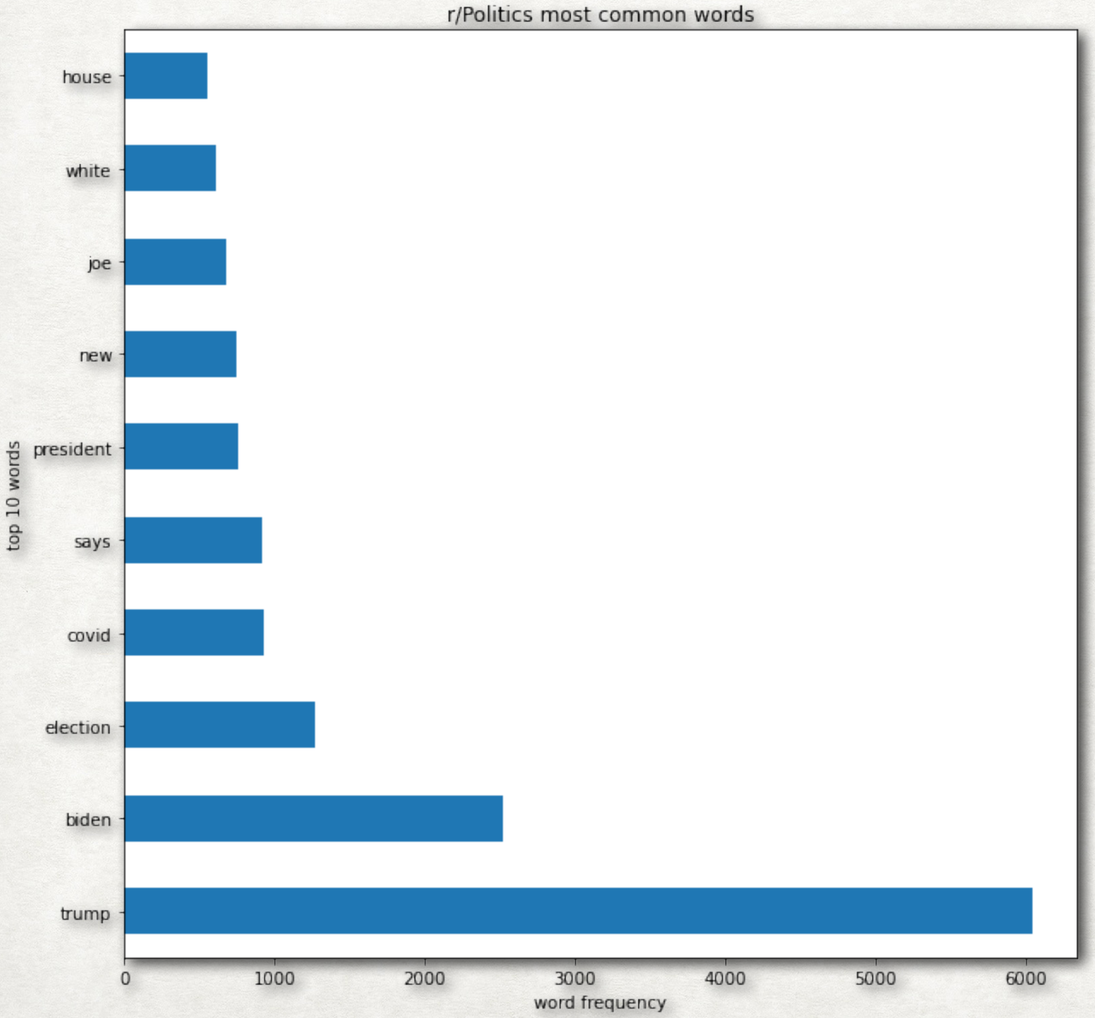
THE DATA

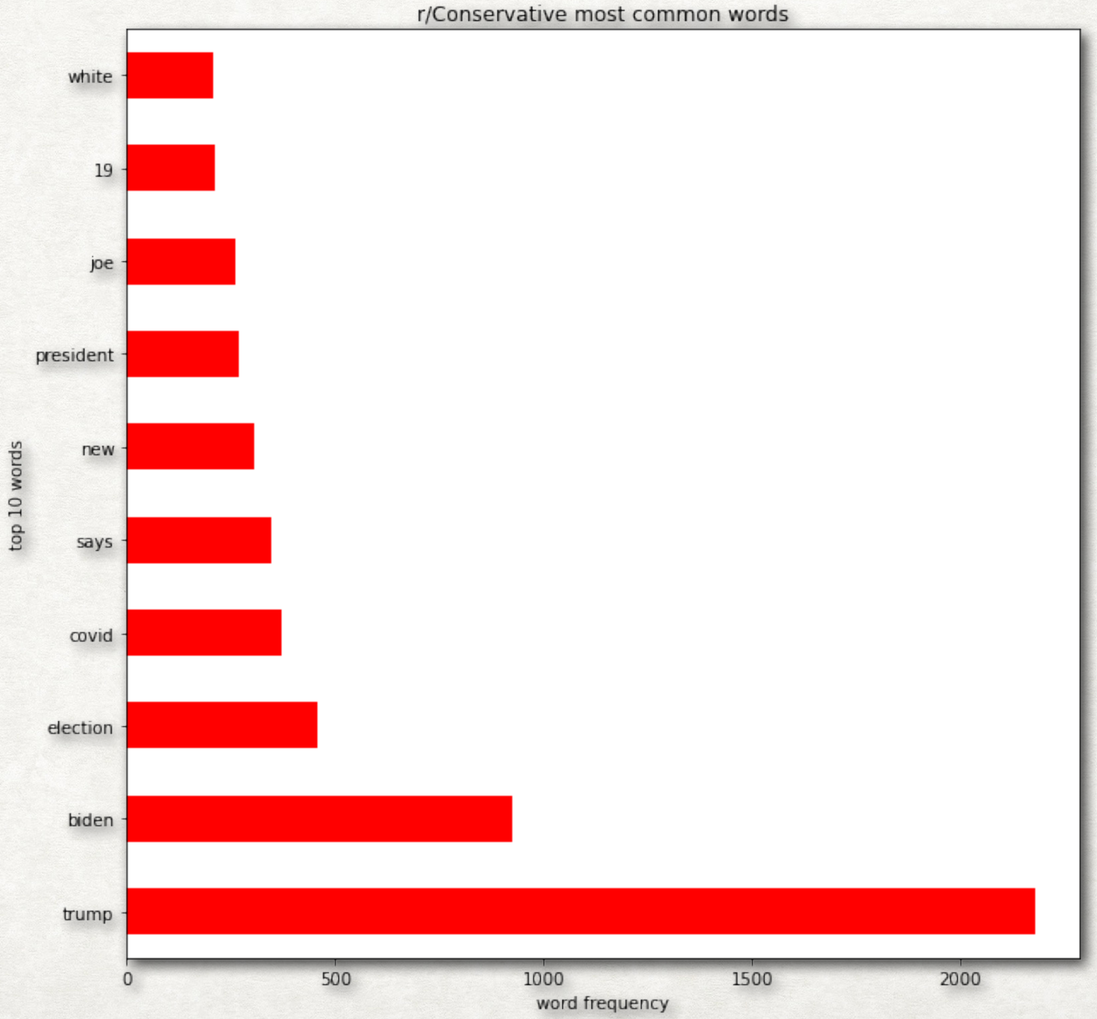
- Data was collected with up to 100 posts from each of the last 200 days from each subreddit:
    - r/Politics = 19,807 posts
    - r/Conservative = 16,164 posts
- ALL data collected was strictly post titles.
    - Why is this good?
        - More uniform text, generally following newspaper publishing standards (No emojis, few typos, no urls, etc.)
    - Why is this bad?
        - Less text than a full-body text submission, so I need to acquire a huge number of samples.

THE DATA

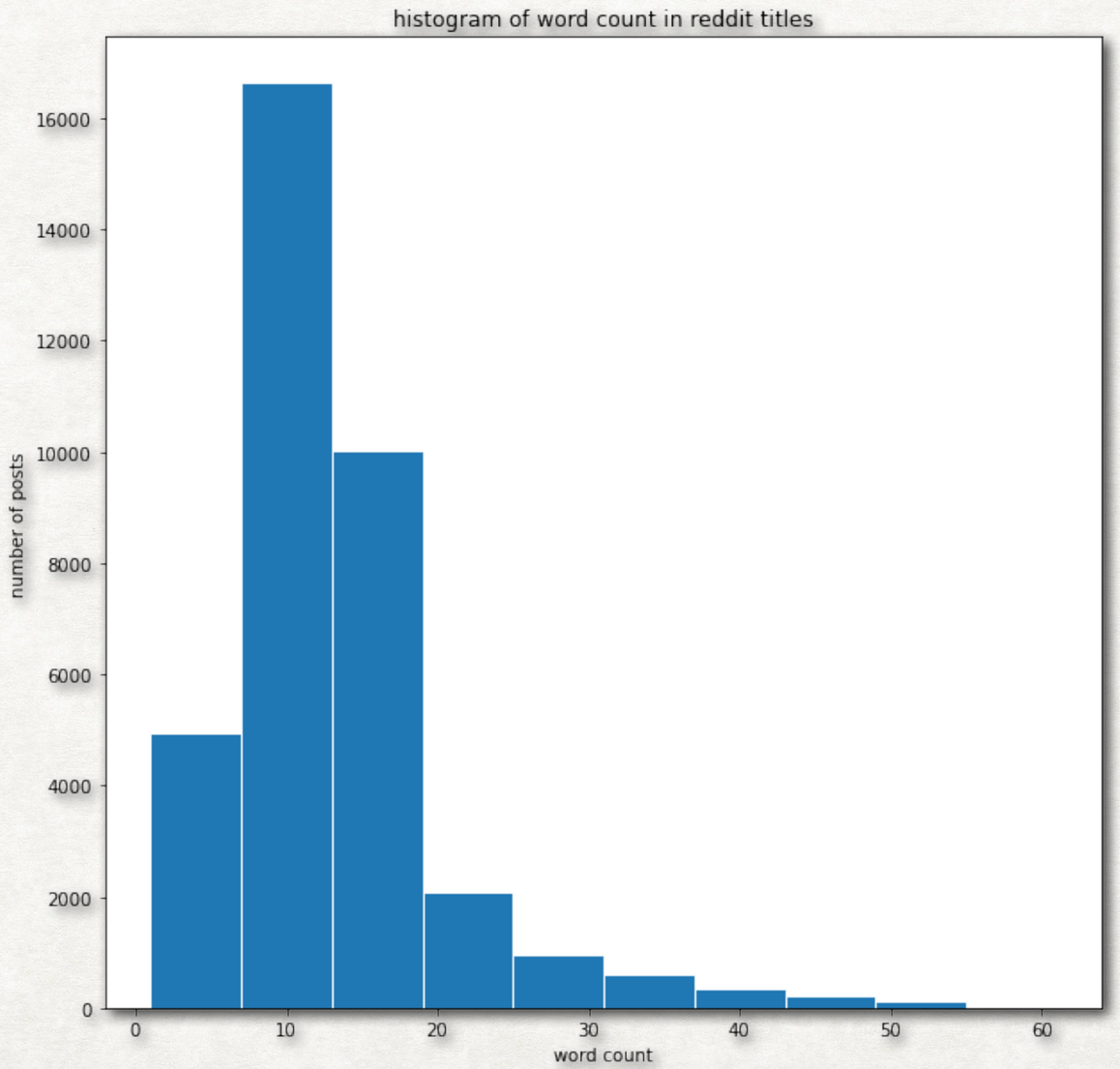
THE BIG PROBLEM

- There is significant overlap between the content of the two subreddits.





THE DATA


histogram of word count in reddit titles
number of posts
16000
14000
12000
10000
8000
6000
4000
2000
0
0
10
20
30
40
50
60
word count

THE MODELS

- 5 models were fit:

    1. Logistic Regression
    2. k-Nearest Neighbors
    3. Random Forest
    4. Multinomial Naive Bayes
    5. GradientBoosting

- Each model was tuned through GridSearch and the text data was vectorized through TfidfVectorizer.

- For clarity, the “0” class corresponds to r/Conservative, and the “1” class corresponds to r/Politics.

THE NULL MODEL

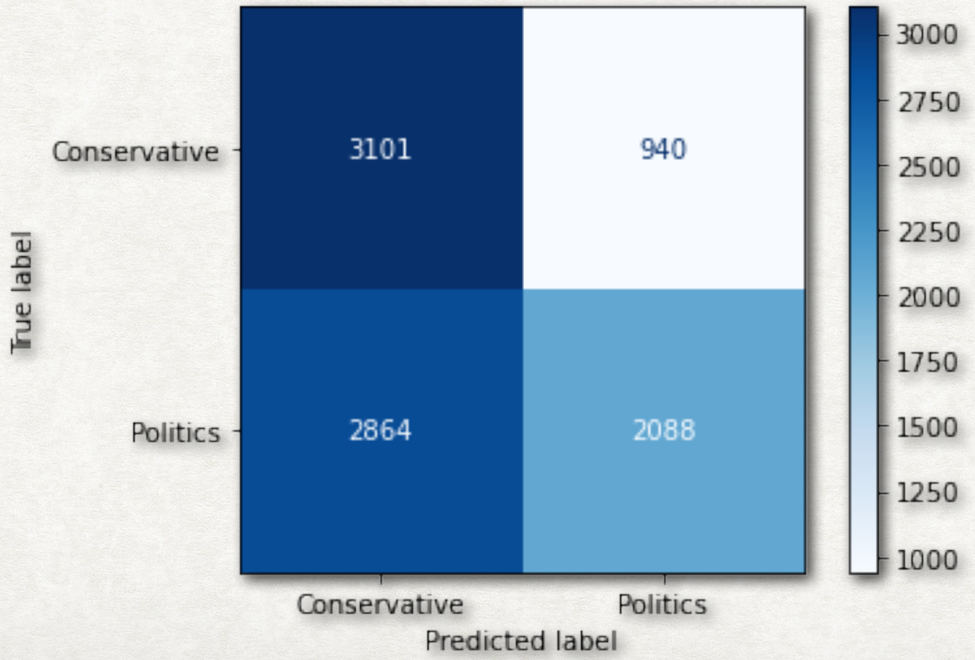
- r/Politics is the majority class in the data, comprising 55% of the observations.
- The baseline model would always predict that a post came from the Politics subreddit, and it would be correct 55% of the time.

```
In [31]: 1 y.value_counts(normalize = True)

1    0.550638
0    0.449362
Name: subreddit, dtype: float64
```

WHICH MODEL DID POORLY?

- kNN: The best trained kNN model only achieved 57.7% accuracy (only 2.7% higher than the null model).
- My speculation is that the poor performance of the kNN model is due to the extreme overlap between the two subreddits (even with stop-words accounted for).

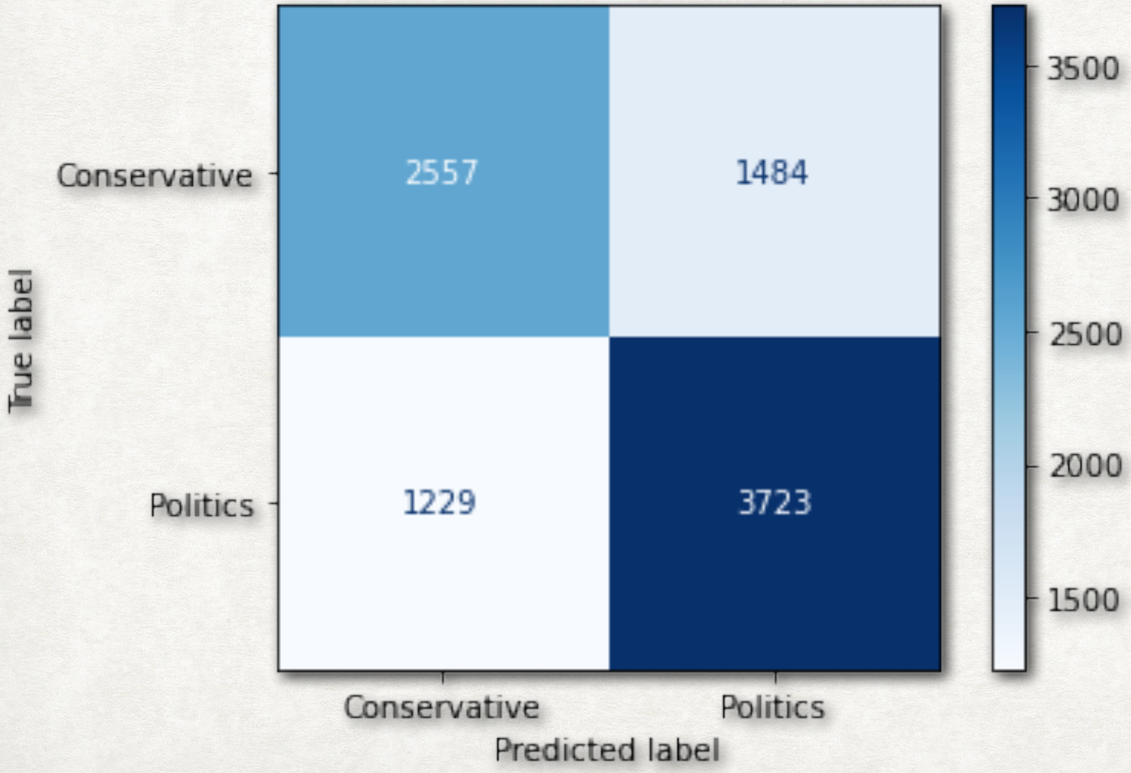


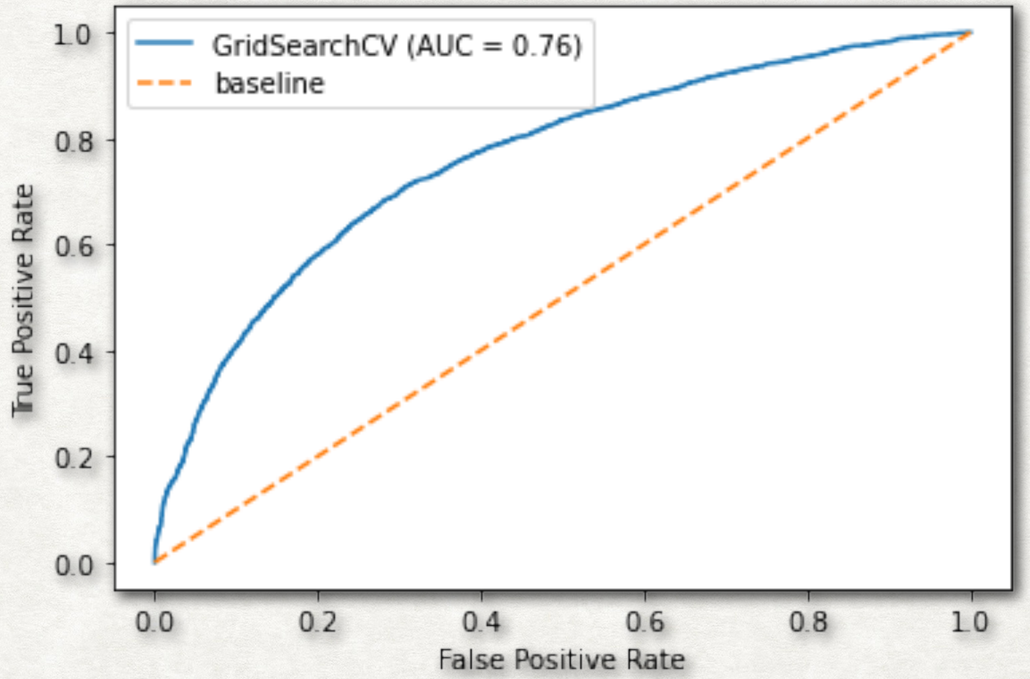

```
3  recall = recall_score(y_test, knn_preds)
4  recall
```

```
0.42164781906300486
```

WHICH MODEL DID WELL?

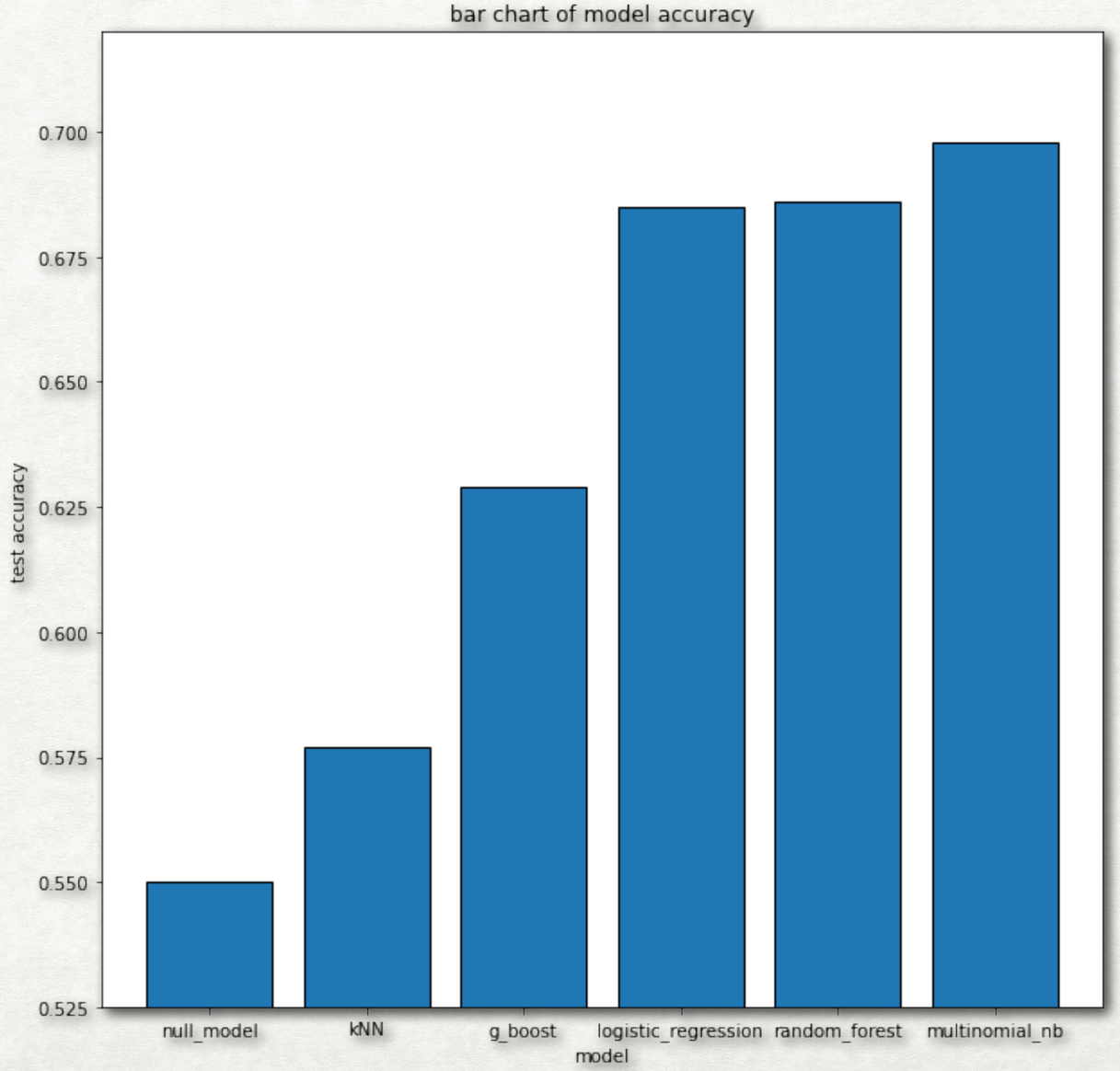
- Multinomial Naive Bayes: The best trained MultinomialNB model achieved 69.8% accuracy on the test data (14.8% higher than the null model).





ALL THE MODELS!

	model	test_accuracy
0	null_model	0.550
1	kNN	0.577
2	g_boost	0.629
3	logistic_regression	0.685
4	random_forest	0.686
5	multinomial_nb	0.698



MISSION ACCOMPLISHED?

- Sort of. Overall, I'm pretty happy with 70% accuracy.
- More could be done to tune hyper-parameters (particularly in the boost models).
- Feature engineering and incorporating non-text data.