

Project 3: Web APIs & NLP



Malcolm Lau • 22.01.2022 (Total Slides:17)

Background

- Common for inappropriate content such as illegal/undesirable activities to be posted online on Reddit before those posts can be removed.
- Reddit is quite hands-off with moderating subreddits, leaving it completely to the moderators to do so



Problem Statement



WHO ARE WE

Tech Consultants engaged by moderators of the r/Football subreddit

Our Task

To detect whether a post is related to soccer betting in the subreddit and flag it for removal for the benefit of users who are minors

Deliverable

To build a binary classification model that would classify whether a post belonged to r/Football or r/Soccerbetting.

The classification result will be used as a proxy to detect posts that contain betting/gambling content.

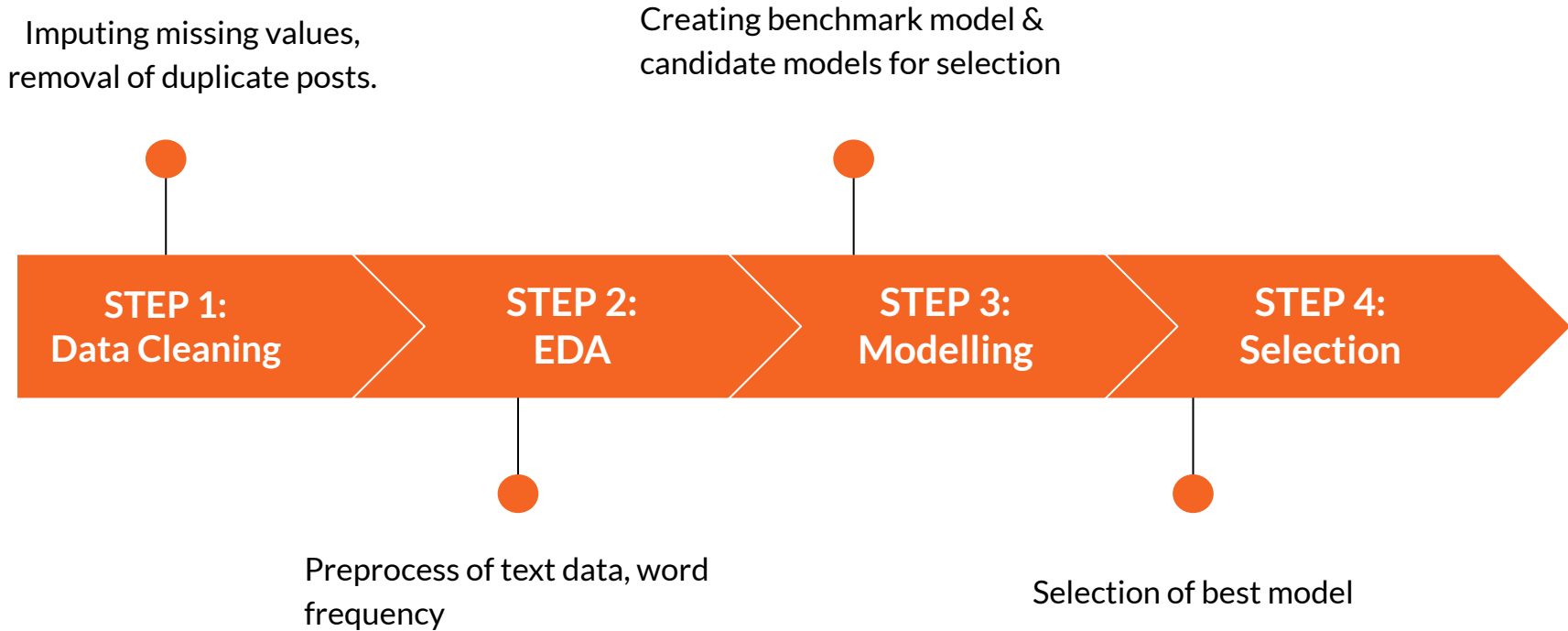
Scope

1. Methodology

- a. Data Cleaning
- b. EDA
- c. Modelling
- d. Selection

2. Results & Observations

3. Future Work



STEP 1:
Data Cleaning

STEP 2:
EDA

STEP 3:
Modelling

STEP 4:
Selection

	subreddit	selftext	title
0	football	How many other current footballers (age 19 to ...	Alex Ferguson said "Give me Zidane and 10 piec...
1	football	NaN	let me present the worst rating system in foot...
2	football	I want to inspire myself. I would prefer answe...	Who are some footballers with a great hard wor...
3	football	[removed]	Who are some players with the best mentalities...
4	football	[removed]	African Cup of Nation 2022 kicked off in Camer...

(4000, 3)

4000 posts obtained

1308 posts missing values

1230 posts removed/deleted

64 duplicate posts

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Missing values filled with content from 'title'

Removed/Deleted posts dropped

Duplicate posts dropped

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	subreddit	selftext	title
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DataFrame Size After Cleaning

(2706, 3)

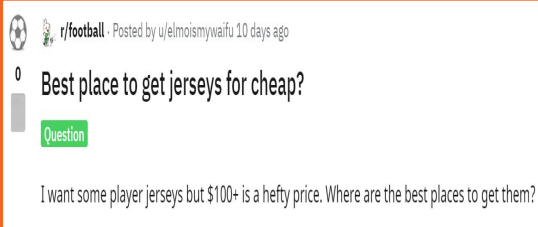
STEP 1: Data Cleaning

STEP 2: EDA

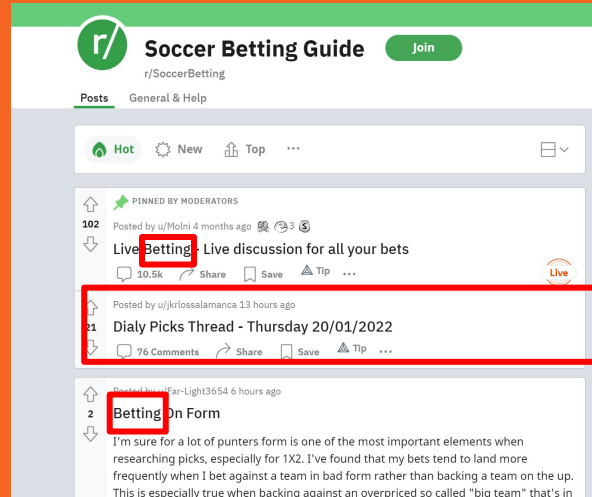
STEP 3: Modelling

STEP 4: Selection

Removing non-text characters

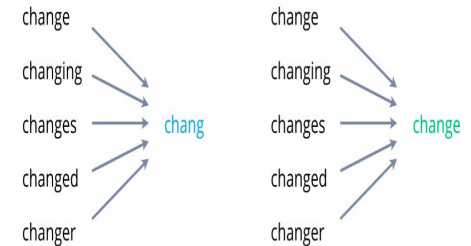


Removing Unhelpful Words



Lemmatization, Stemming

Stemming vs Lemmatization



STEP 1:
Data Cleaning

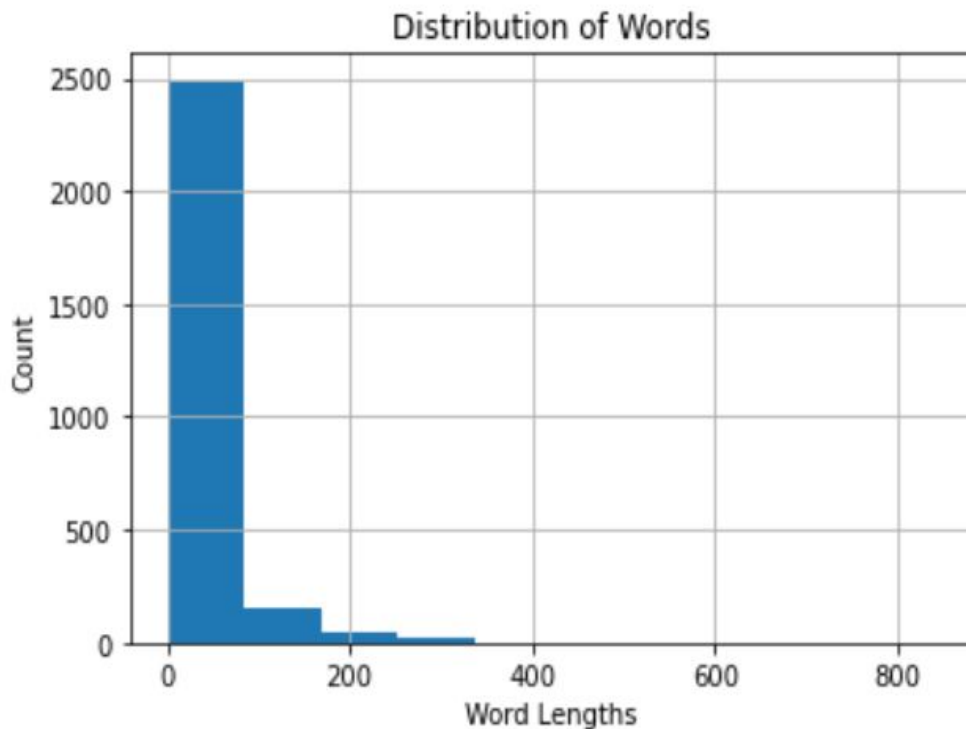
STEP 2:
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count	2706.000000
mean	27.090909
std	49.774499
min	1.000000
25%	5.000000
50%	11.000000
75%	27.000000
max	839.000000

1	0.56578
0	0.43422



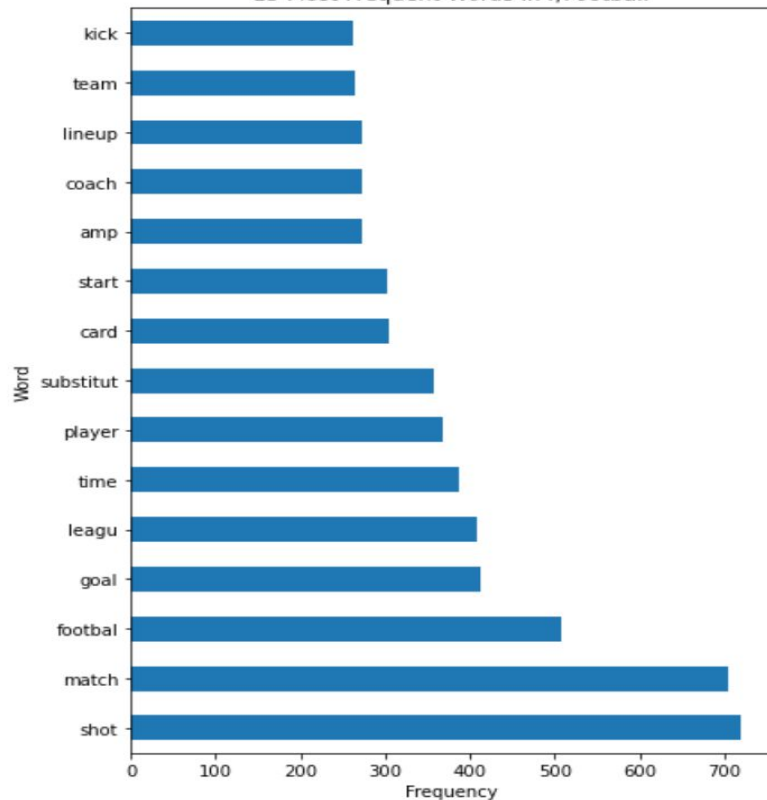
STEP 1:
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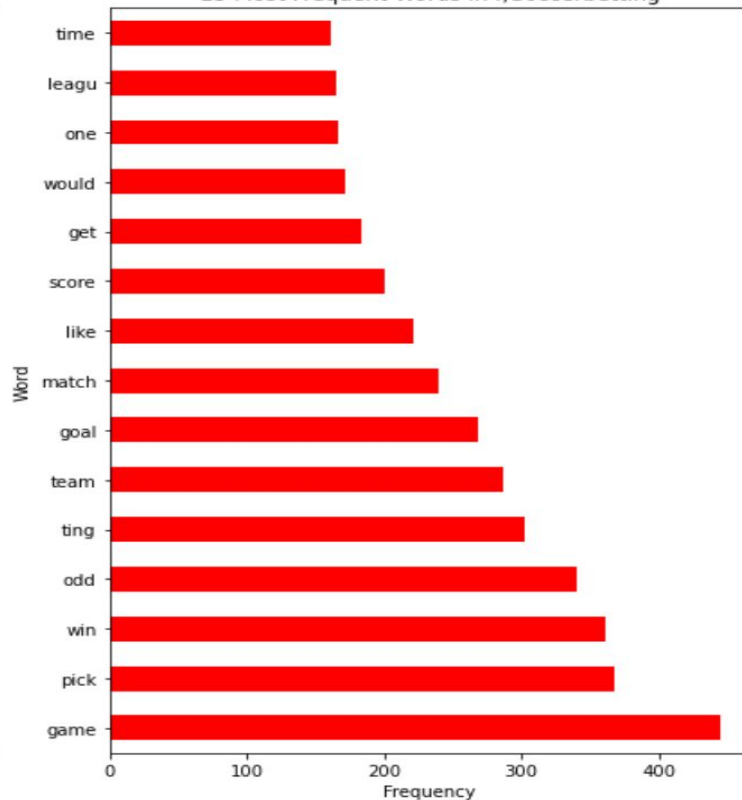
STEP 3:
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15 Most Frequent Words in r/Football



15 Most Frequent Words in r/Soccerbetting



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{ 2706, 3 }

STEP 1:
Data Cleaning

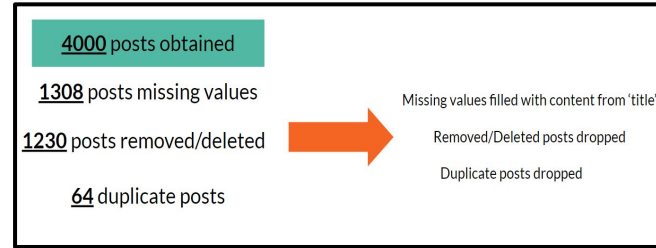
STEP 2:
EDA

STEP 3:
Modelling

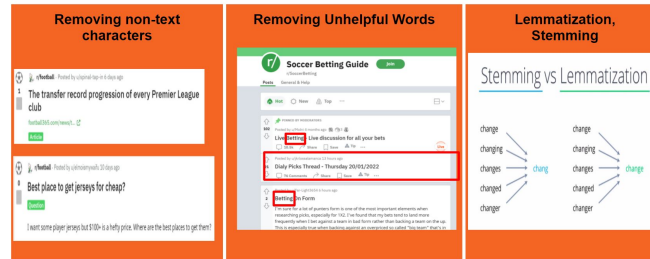
STEP 4:
Selection

Clean Data

2706, 3



Preprocess



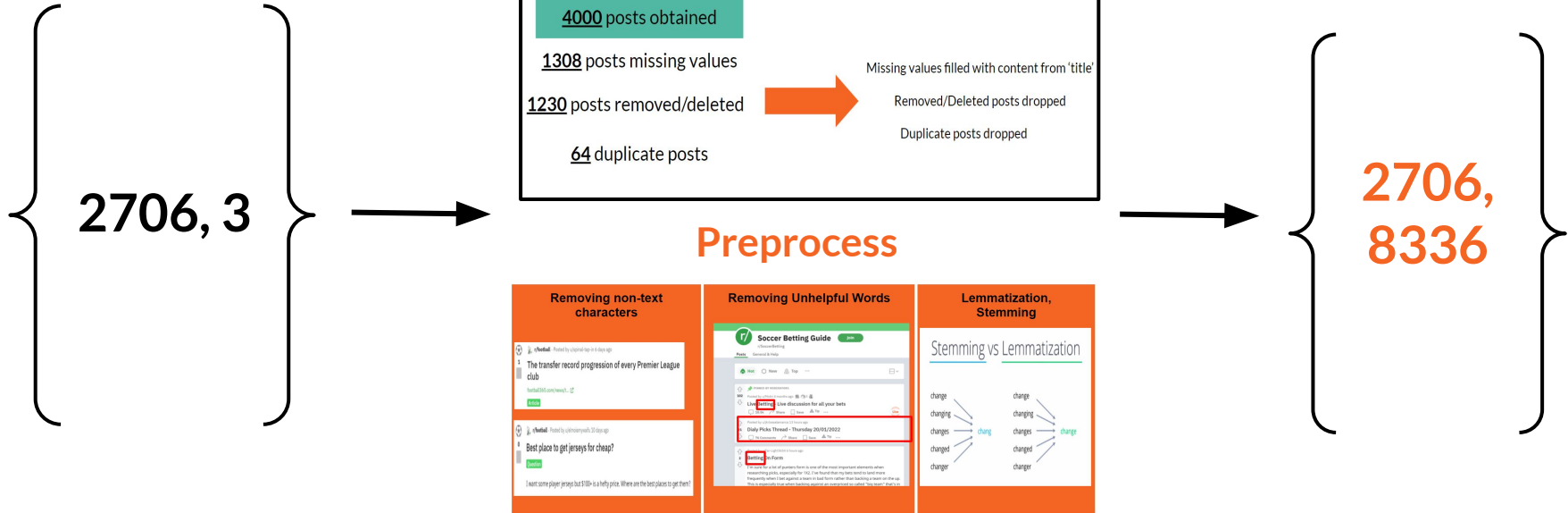
STEP 1:
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Clean Data



STEP 1:
Data Cleaning

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Model	Text Vectorization
Multinomial Naive Bayes	TF-IDF Vectorization
K Nearest Neighbors	TF-IDF Vectorization
Random Forest	TF-IDF Vectorization
Logistic Regression	Count Vectorization

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Performance Metrics to optimize for



r/Football

$$\text{Sensitivity} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}$$



r/Soccerbetting

$$\text{Specificity} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False Positives}}$$

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Performance Metrics to optimize for



r/Football



r/Soccerbetting

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$$\text{Specificity} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False Positives}}$$

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Model	Text Vectorization	Train Score	Test Score	Specificity	Recall	Precision	F1	AUC
Multinomial Naive Bayes	TF-IDF Vectorization	0.972	0.913	0.867	0.948	0.875	0.925	0.966
K Nearest Neighbors	TF-IDF Vectorization	0.916	0.897	0.823	0.953	0.875	0.913	0.952
Random Forest	TF-IDF Vectorization	1	0.897	0.806	0.966	0.867	0.914	0.957
Logistic Regression	Count Vectorization	0.989	0.894	0.816	0.953	0.871	0.910	0.957

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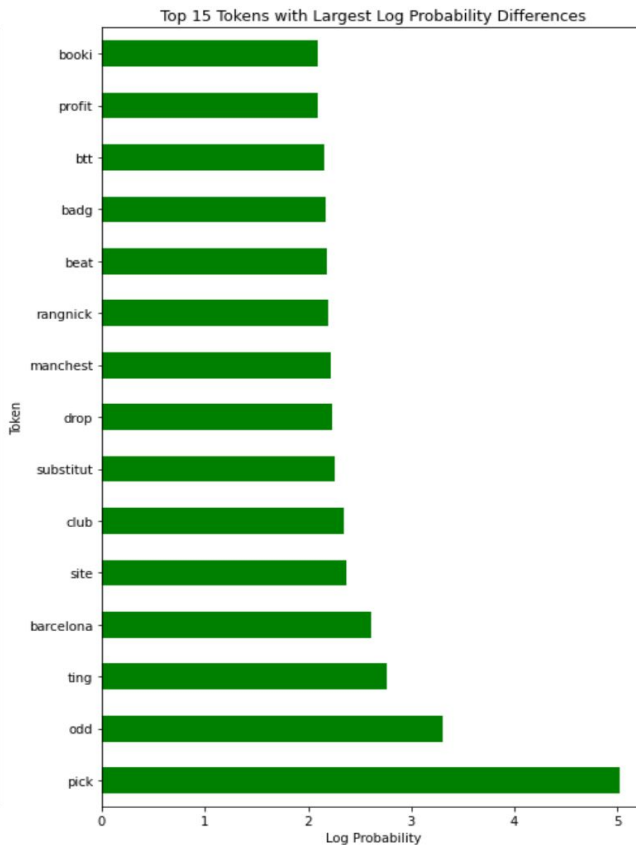
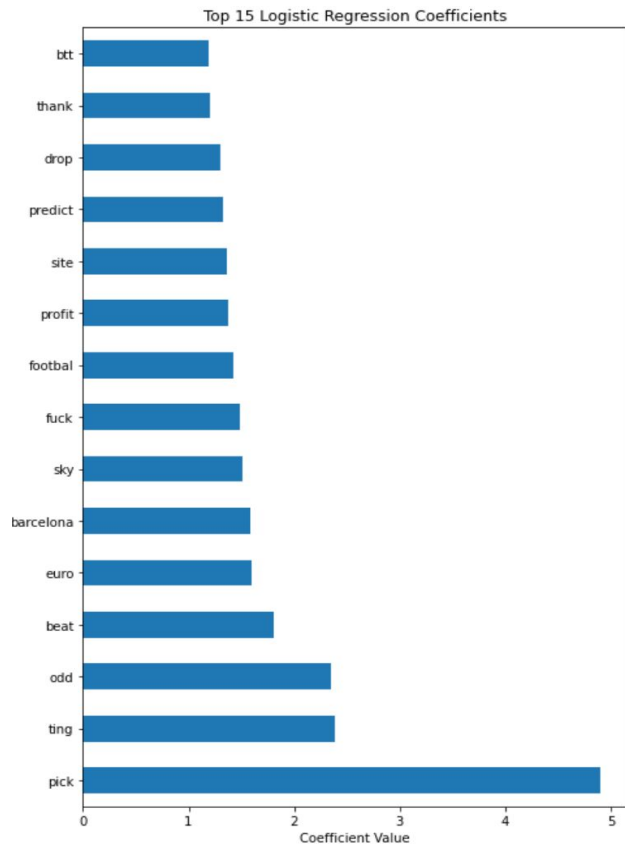
Model	Text Vectorization	Parameters
Multinomial Naive Bayes	TF-IDF Vectorization	<code>{'tvec__max_features': 8000, 'tvec__min_df': 1, 'tvec__ngram_range': (1, 1), 'tvec__stop_words': None}</code> Multinomial NB Parameters: Default
K Nearest Neighbors	TF-IDF Vectorization	<code>{'knn__metric': 'euclidean', 'knn__n_neighbors': 15, 'knn__p': 'uniform', 'tvec__max_features': 8000, 'tvec__min_df': 1, 'tvec__ngram_range': (1, 1), 'tvec__stop_words': 'english'}</code>
Random Forest	TF-IDF Vectorization	<code>{'rf__max_depth': None, 'rf__max_samples': None, 'rf__n_estimators': 100, 'tvec__max_features': 8000, 'tvec__min_df': 1, 'tvec__ngram_range': (1, 1), 'tvec__stop_words': 'english'}</code>
Logistic Regression	Count Vectorization	Default

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Observations

- 60% of the features are common, which is expected. This is why the performance metrics are very close.
- In fact, the top 3 contributors for both models are identical. We can infer that the tokens: **pick**, **ting** & **odd** are the most important contributors to the model.

Next steps

Increase Model Vocabulary

Data can be obtained from other subreddits which centre on gambling in general such as **r/Gambling**, this will increase the model's ability to generalize when exposed to more generic words associated with gambling.

Improve Data Quality

One of the likely reasons for misclassification is typo errors from the user. Rectifying spelling mistakes will enable improve lemmatization and stemming performance, which will likely contribute to improvements in model performance as well.

Possible solution: Use Word module from **Textblob Library**

End of Presentation
