

Introduction

Sensationalism. Spin. Clickbait headlines. Time and time again, it seems that most of the news headlines we read today are imbued with negativity. But are these negative headlines truly reflective of their respective article contents? Or is the media leveraging negativity bias to capture our attention? To draw in more readers? To maximize their profits? By performing sentiment analysis on headlines and their corresponding article content, we investigated our primary hypothesis: article headlines are more negative than their respective article bodies.

Hypotheses

- To assess the validity of our intuitions, we tested the following:
- Is there a significant difference between the sentiment scores of headlines and their corresponding articles?
 - Are the sentiment scores of arts headlines significantly greater than the sentiment scores of technology headlines?
 - Is the mean difference in sentiment scores for headlines and their corresponding articles for a given author the same across all authors?

Data

- We scraped the data from the NYT articles database using the NYT Article Search API. Each article was published between 2018 and 2022 and is classified as business, technology, science, education, arts, health, or opinion.
- Our LSTM model was trained on the SST-5-FINE GRAINED dataset, which contains movie reviews and their corresponding numerical sentiment labels.

Challenges

- Due to the query limit per minute on the NYT API, scraping the text for each article took longer than expected
- Dealing with missing values (e.g. author name, subcategory, print headline)
- Duplicate headline values for certain articles

Methodology

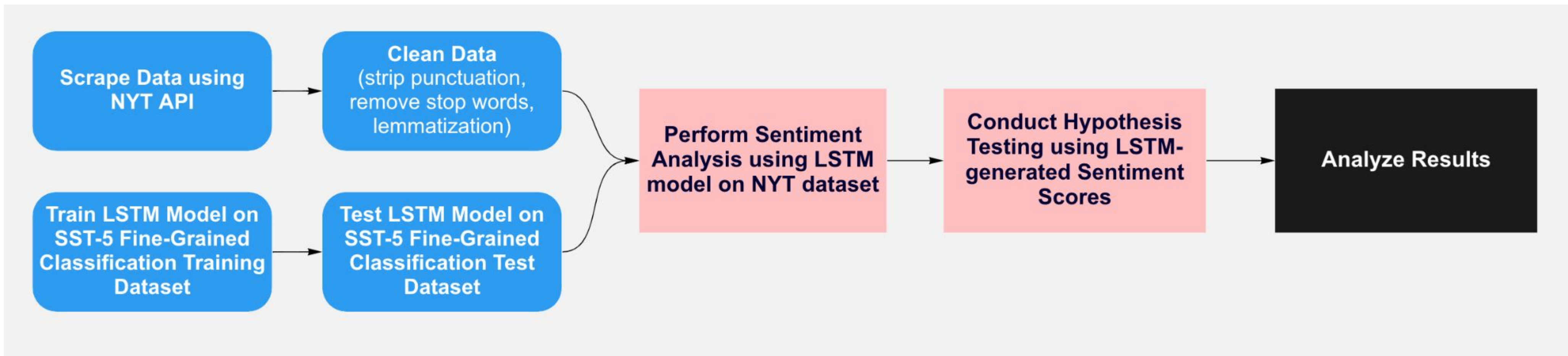


Figure 1. Data analysis pipeline using NYT dataset and SST-5 Fine Grained Classification dataset

Integer Labels	Sentiments
0	Strongly Negative
1	Weakly Negative
2	Neutral
3	Weakly Positive
4	Strongly Positive

Figure 2. Key for LSTM-generated scores

Results and Visualizations

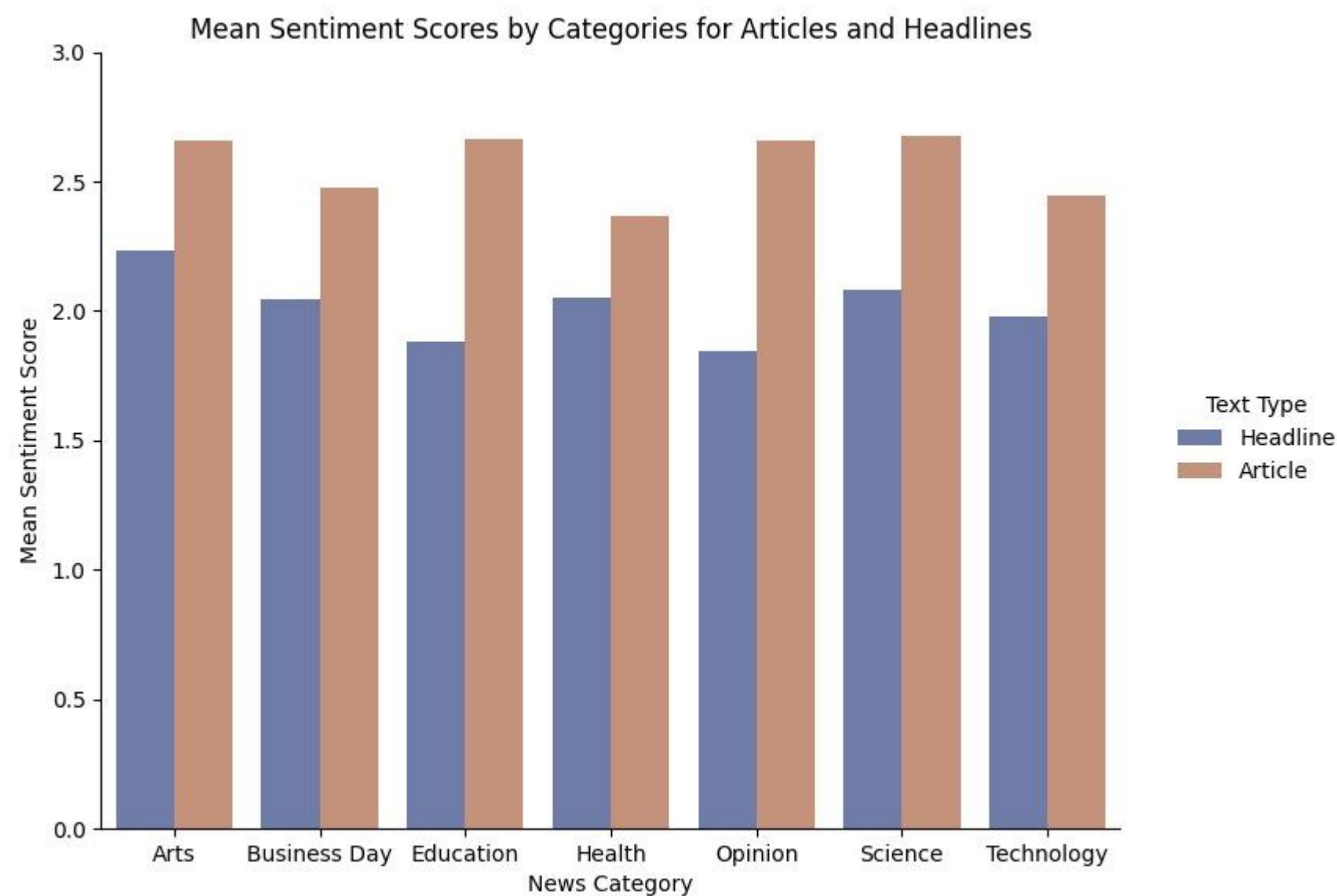


Figure 3. Mean sentiment scores for headlines tend to be lower than articles across the different categories (0: strongly negative, 1: weakly negative, 2: neutral, 3: weakly positive, 4: strongly positive)

The mean sentiment scores of headlines is significantly lower than the mean sentiment scores of their corresponding articles. Since each article has two paired measurements (headline rating and article rating), we ran a paired t-test to assess whether headline sentiment ratings were significantly different from article sentiment ratings. Based on the results of our paired t-test, we see that headlines seem to be more negative than their corresponding articles ($t = -15.84$, $p = 1.52e-52$).

To assess whether certain authors were more likely to write headlines with sentiment ratings that diverge from the sentiment ratings of their corresponding articles, we ran a one-way ANOVA test on the computed mean differences between headlines and articles for each author . We found that there was no statistically significant difference in the mean differences in sentiment ratings between headlines and articles for the authors in the dataset ($F = 1.04$, $p = 0.30$).

Limitations

Our model only outputted 5 integer labels representing the sentiments. Outputting more integer labels would allow for a finer analysis. Our results are also limited by the general limitations of sentiment analysis. Our model test accuracy was 39%. It seems that our model could not escape pitfalls in sentiment analysis such as irony, forms of sarcasm (such as embedded and prepositional sarcasm), satire and even multipolarity in sentences.

Significance

Our results suggest that headlines impart more negativity than their corresponding articles. Negative news can be misleading. It can distort our thinking by engaging cognitive biases. News outlets are in a position of power; they package important events for our consumption. It is essential that news outlets are not foregoing authenticity for the pursuit of profits. Future directions entail using an LSTM model with a higher accuracy and analyzing articles from other news outlets with contrasting economic and political views.

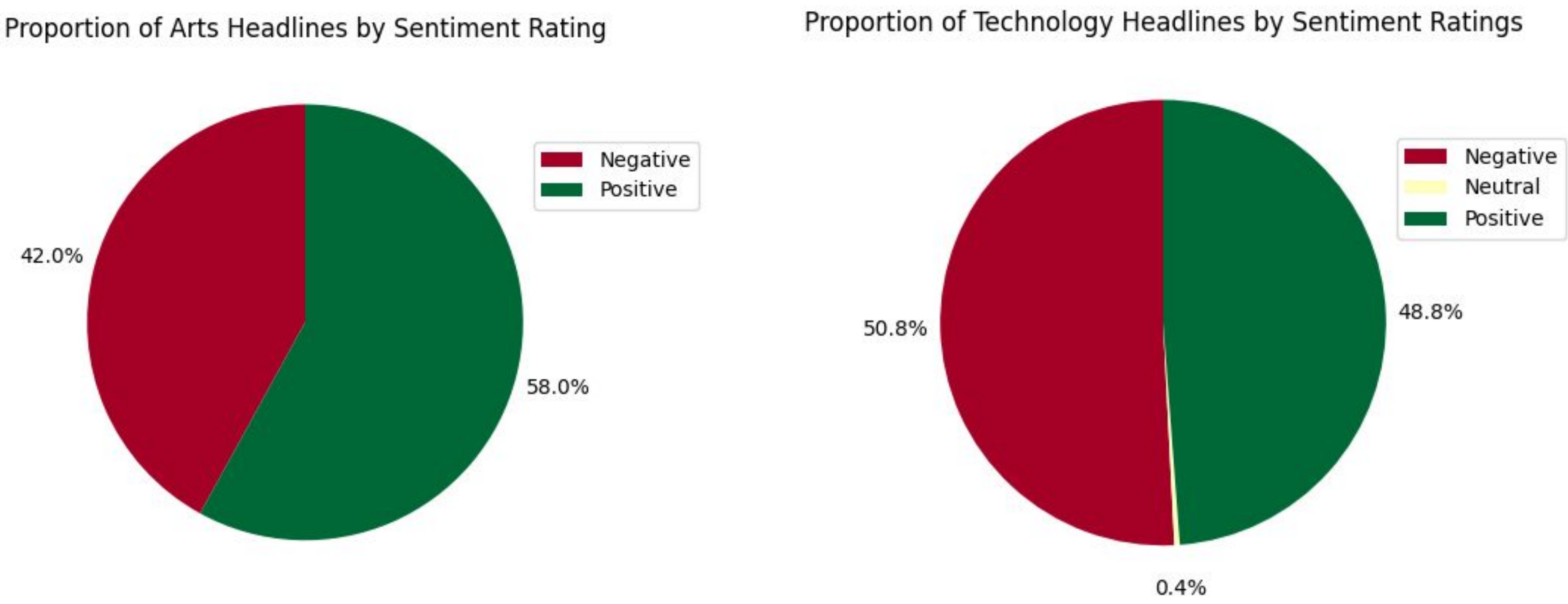


Figure 4. Arts headlines tend to be more positive than technology headlines (Negative: 0 and 1, Neutral: 2, Positive: 3 and 4). Two-sample t-test showed that the mean sentiment score of arts headlines is significantly greater than the mean sentiment score of technology headlines ($t = 2.68$, $p = 0.0038$).