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Original Article

Emotional Amplification in News Headlines Compared to Article Content: A Statistical Analysis

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Abstract

News headlines are crucial in shaping the perception of readers because they provide a short and attention-grabbing article content. In this study, the emotional content of news headlines in comparison with news article content is analyzed, in order to explore the phenomenon of emotional amplification in news headlines. The NRC Emotion Lexicon and NRCLex framework were used to calculate emotional scores for four categories: anger, fear, joy, and sadness. Emotion variations at headline level and article and sentence level were measured using the proposed Emotional Amplification Index. The results reveal that emotional amplification takes place in almost 20% to 25% of the headlines analyzed, and fear is the most common emotion that is amplified. However, sentence-level analysis reveals that headlines do not tend to rise above the 'feel' of the highest impact sentence in the article. These findings were further verified by statistical analysis of the data tested across the analyzed corpus.

Categories: Computational Linguistics , Data Analysis, Natural Language Processing (NLP)

Keywords: emotion analysis, news headlines, emotional amplification, natural language processing, sentiment analysis, media framing, data analysis, news articles

Introduction

News headlines play an important role in shaping public perception and influencing how readers interpret news stories. In the digital age, where information consumption is rapid and readers' attention spans are limited, headlines often serve as the primary point of contact between readers and news content. An engaging or attention-grabbing headline can significantly increase click-through rates, social media sharing, and overall readership. However, the strong focus on engagement may also lead to emotional framing that does not necessarily reflect the tone of the full article. Because headlines are often the first and sometimes only part of an article that readers encounter, emotionally intensified wording may influence perceptions before the full article content is examined. This makes the study of emotional amplification particularly important in understanding modern digital news consumption patterns and media framing practices.

Framing as a concept in media communication has long been studied in communication theory. Entman [1] described media framing as the process of emphasizing certain aspects of information in a way that shapes how audiences interpret events and narratives. Because headlines are short and highly visible summaries of news stories, they often highlight particular emotional cues to capture reader attention. For example, headline such as "Markets panic as crisis deepens" may communicate substantially stronger emotional intensity than the corresponding article text describing the same event in a more descriptive and contextual manner.

With the advancement of Natural Language Processing (NLP) and the increasing availability of large textual datasets, researchers can effectively analyze sentiment and emotional patterns in news media. Modern approaches highlight that the sentiment analysis is a multifaceted task involving semantic and contextual understanding rather than simple polarity classification. This makes it well-suited for analyzing nuanced textual content such as news headlines [2]. Lexicon-based approaches, such as those using the NRC Emotion Lexicon, provide a structured method for quantifying emotional categories such as anger, fear, joy, and sadness type of emotion within written text [3]. These computational tools enable large-scale analysis of emotional patterns present in news content.

Emotional cues embedded in news headlines can strongly influence how readers perceive and evaluate information. Studies have shown that emotional reactions affect individuals' susceptibility to misinformation and their judgments about news credibility. In many cases, the believability of a headline is influenced by contextual expectations as well as the level of trust readers place in the news source [4,5]. These findings highlight the importance of examining the emotional characteristics of headlines and their relationship with the broader content of the associated articles.

Despite the significant amount of research in sentiment analysis and media framing, relatively few studies have quantitatively examined whether headlines consistently amplify emotional signals compared to the content of their corresponding articles. To address this gap, this study introduces the Emotional Amplification Index (EAI), a statistical metric designed to measure variations in emotional intensity between news headlines and article bodies. Using the NRC Emotion Lexicon, emotion scores for anger, fear, joy, and sadness are calculated at both the article and sentence levels across a large collection of news articles. Paired hypothesis testing is then used to evaluate the statistical significance of these differences.

The primary contributions of this work are as follows:

1. We propose EAI, a quantitative metric for measuring emotional divergence between headlines and article content at both article and sentence levels.
2. We conduct a statistical analysis of emotional amplification across 4,000 news articles collected from multiple news sources.
3. We identify which emotional categories are most frequently amplified in headlines, providing empirical insight into emotional framing practices in modern journalism.

Materials And Methods

Literature review

Studies on audience perception and news credibility have highlighted the impact of headlines on how the public interprets news events. Blom [4] examined how readers evaluate the plausibility of political news headlines and found that prior assumptions about the news content and trust in the news source significantly influence perceptions of credibility. This study provides an important foundation for understanding why emotional cues embedded in headlines may have a disproportionate impact on audience perception. It demonstrates that the presentation of a headline can strongly influence reader interpretation even when the underlying article content remains unchanged.

The development of lexicon-based tools has been central to enabling large-scale emotion analysis in textual data. Mohammad and Turney [3] developed the NRC Emotion Lexicon using crowdsourcing methods, associating words with specific emotional categories such as anger, fear, joy, and sadness. Since its introduction, this lexicon has been widely applied in numerous studies and serves as the backbone of the present research for quantifying emotional intensity at both the headline and article content levels.

Studies examining automated classification and analysis of large news corpora have expanded the application of NLP methods in news content analysis [6]. Such research supports the methodological framework used in the present study by demonstrating the feasibility and scalability of computational approaches for analyzing emotional signals across large collections of news articles.

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Several computational studies have applied NLP and machine learning techniques to analyze sentiment in news headlines at scale. Hossain et al. [7] applied text mining and sentiment analysis to newspaper headlines from a leading Bangladeshi daily using word cloud visualization, sentiment scoring, and cluster analysis to identify dominant emotional patterns. Their findings revealed a predominance of negative sentiment in front-page headlines, demonstrating that computational methods can effectively uncover latent emotional patterns in news media.

Complementing this work, Roy et al. [8] employed Count Vectorization and Term Frequency-Inverse Document Frequency Vectorization techniques to classify headline sentiment, achieving an accuracy of 90.25% with the Count Vectorizer approach. Their study reinforces the viability of automated sentiment scoring methods for short-form textual units such as news headlines, which are the primary unit of analysis in the present research.

Using transformer-based language models to classify headlines according to mood and emotion, Rozado et al. [9] conducted a large-scale longitudinal study analyzing more than 23 million headlines from 47 major U.S. news outlets between 2000 and 2019. Their findings showed a steady increase in negative sentiment over time, along with noticeable differences among outlets with varying political orientations. This widespread evidence of emotional intensification in news headlines directly motivates the present investigation into whether such intensification reflects a systematic amplification of emotion relative to the body content of the same articles.

Mousoulidou et al. [10] investigated the influence of social media news headlines on readers' emotional states, emotion regulation and psychological well-being. They highlighted that there is a significant role of headlines which play in shaping emotional responses. Similarly, Nabi et al. [11] explored how scanning emotionally framed health news headlines can affect readers' trust in scientific information, demonstrating that headline framing can influence perceptions and credibility judgments. Research on news framing further shows that different framing strategies can significantly impact perceived risk, emotional reactions and learning outcomes among readers, as demonstrated by Otieno et al. [12]. In addition, recent computational approaches have explored affective reframing of news content using modern language models, showing how emotional tone in news articles can be systematically modified to influence user engagement in recommender systems as per Jeng et al. [13]. Studies have also examined the role of emotional framing in the spread of information online, with Hosseini and Staab [14] demonstrating that emotional cues can influence the dissemination of both true and false claims in digital environments. Bhuvaneswari et al. [15] have also worked on fake news detection using traditional pipelines. However, they also did not compute the amplification score, which leaves this domain as an unexplored gap in the research.

On a concluding note, despite the progress made in understanding headline sentiment and reader perception, most existing studies treat headlines in isolation without systematically comparing their emotional intensity with the content of the corresponding articles. The present study addresses this gap by introducing a statistical methodology for measuring emotional amplification between news headlines and article bodies, using the NRC Emotion Lexicon as the primary measurement tool.

Methodology

Dataset

The "All the News" dataset is being used for this work. It is a dataset which includes news articles gathered from several significant media outlets. Fields including title (headline), article body, publication source, and publication date are present in every entry. The dataset does not contain manually annotated emotion labels or sentiment classes and therefore requires external emotion computation techniques for analysis. Only the headline and the entire article text were used in this investigation. To guarantee computing efficiency during sentence-level processing, a subset of 4,000 articles was randomly selected for examination following basic cleaning and the elimination of missing entries. Although the analyzed subset is smaller than datasets commonly used in large-scale deep learning studies it remains sufficiently substantial for statistical analysis of emotional amplification patterns across diverse news content. To improve representativeness, the sampled subset was distributed across multiple publication years (2016-2020) and a diverse range of news organizations including Reuters, The New York Times, CNN, CNBC, Washington Post, Fox News, Politico, Vox, and several business and technology-oriented media outlets. The balanced distribution across publication sources and

temporal periods reduces overrepresentation from any single news outlet or news cycle and improves the external validity of the emotional amplification analysis. The distribution can be observed in Figure *1* and Figure *2*. The link for the dataset is provided in the reference section.

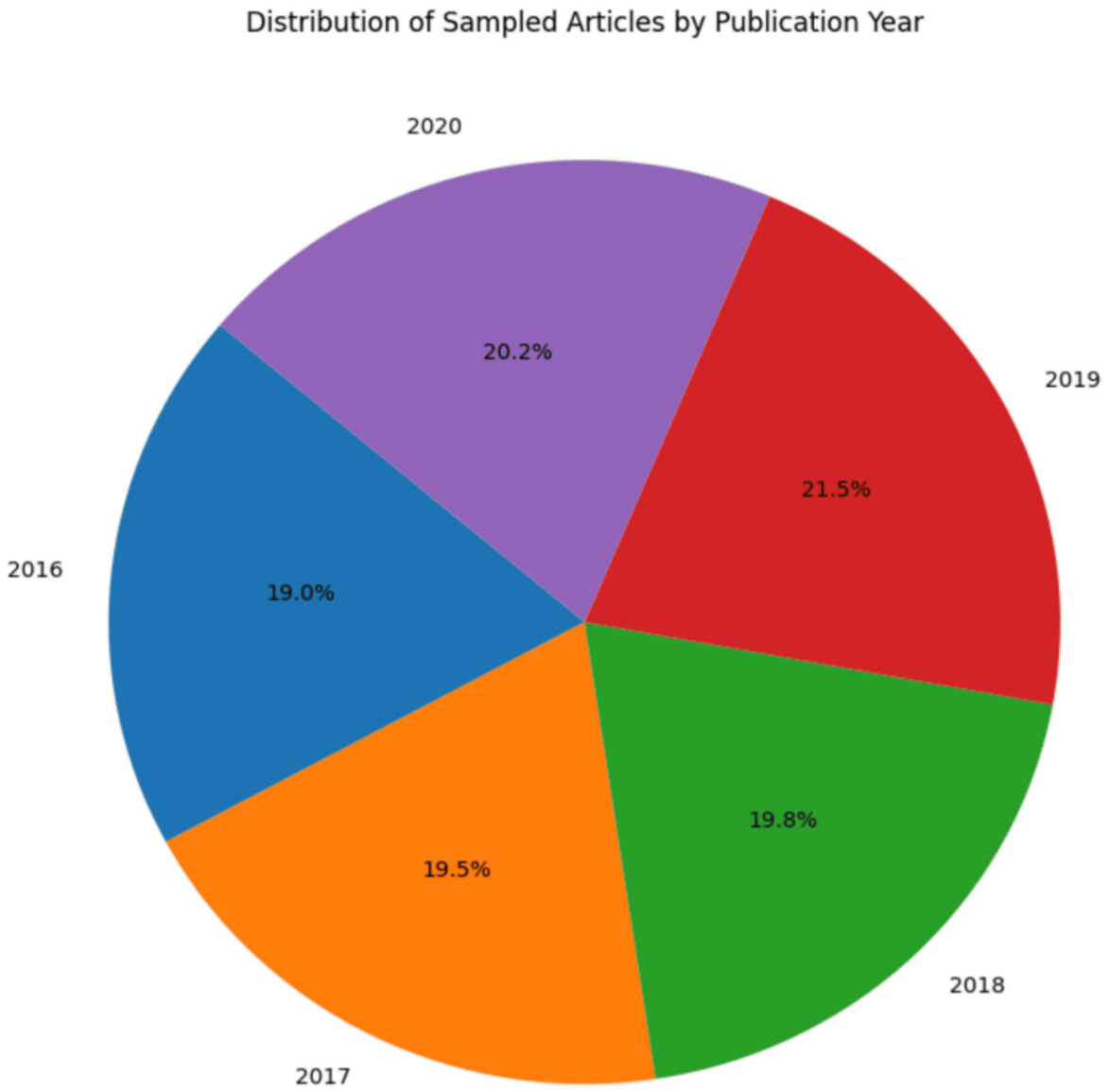


FIGURE 1: Year-Wise Distribution of News Articles

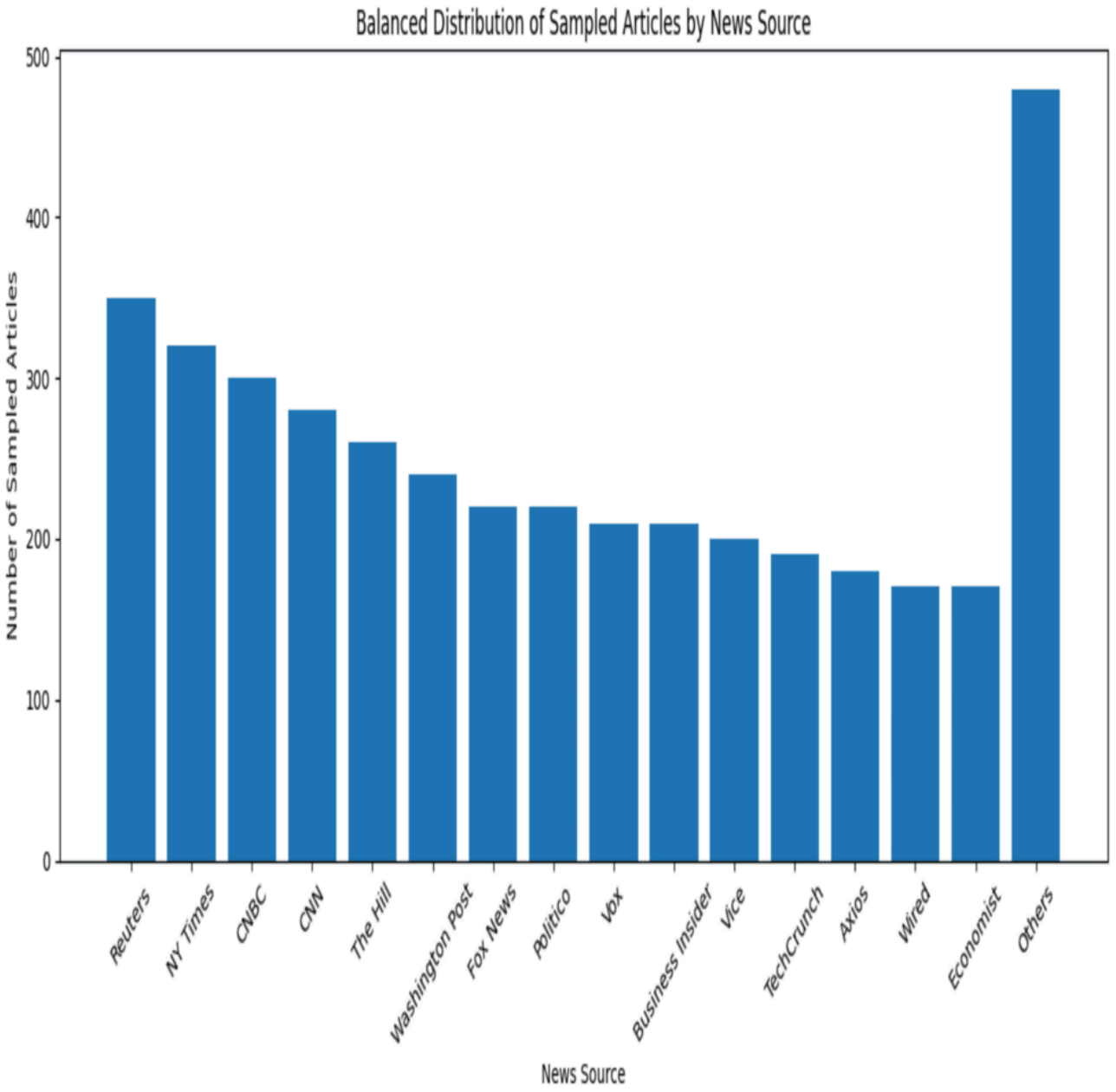


FIGURE 2: News Outlet-Wise Distribution of News Articles

Emotion Detection Using NRC Lexicon

Using the NRCLex Python package and the NRC Emotion Lexicon [3], emotion scores were calculated. The NRC Word and Emotion Association Lexicon was developed by Mohammad and Turney through crowdsourcing and links words to eight fundamental emotional categories. Although transformer-based models such as Bidirectional Encoder Representations from Transformers (BERT) and Robustly Optimized BERT Pretraining Approach (RoBERTa) have demonstrated strong performance in contextual emotion classification tasks, the present study intentionally employs the NRC Emotion Lexicon because the primary objective is comparative emotional density measurement between headlines and article content rather than supervised emotion prediction. Lexicon-based approaches provide transparent and interpretable emotion attribution without requiring labeled training data and are computationally efficient for statistical analysis across

thousands of articles. The use of a lexicon-based framework is particularly suitable for the present work because the proposed EAI depends on consistent and interpretable word-level emotional density computation between headlines and article bodies. Unlike supervised transformer-based models that require labeled training datasets and may produce less interpretable intermediate representations, the NRC Emotion Lexicon enables transparent comparison of emotional intensity across different textual granularities. For the purposes of the present study, four emotional categories that are anger, fear, joy, and sadness emotion. These were selected for analysis because these emotions are most commonly examined in news media research [9].

NRCLex uses the NLTK library [16] to tokenize the input text and generates raw emotion counts based on lexical matches between the words in the text and the entries in the lexicon. These raw counts were then normalized by the total number of words in the text to obtain emotional density scores. This normalization step allowed for fair comparison between headlines and article bodies, which typically differ in length.

For a text segment *T*, the normalized emotion score for emotion *e* is defined as:

$$E(T,e) = \frac{\textbf{Count of words associated with } e}{\textbf{Total number of words in } T} \tag{1}$$

where *T* represents any text segment (either a headline, full article body, or individual sentence), *e* denotes one of the four emotion categories (anger, fear, joy, or sadness), and $E(T,e)$ produces a normalized score in the range of 0 to 1 (both included), representing the proportion of emotionally charged words for category *e* within *T*. This normalization ensures comparability between short headlines and longer article content.

Article-Level Emotion Computation

For each news article, emotion scores were computed separately for the headline and article body text. This enabled measurement of emotional intensity differences between the condensed headline and the complete article content.

Sentence-Level Emotion Analysis

To examine whether headlines exceed the emotional intensity of specific parts of the article, each article was segmented into sentences using the NLTK sentence tokenizer. Emotion scores were computed for each sentence individually. The maximum sentence-level emotion score for each emotion category was then extracted:

$$E_{\max}(A,e) = \max_{s \in A} E(s,e) \tag{2}$$

where *A* represents the set of all sentences in the article, *s* denotes an individual sentence within *A*, *e* denotes the emotion category, and $E(s,e)$ denotes the normalized emotion score of sentence *s* for emotion category *e*, as defined in Equation (1). $E_{\max}(A,e)$ thus represents the peak emotional intensity observed anywhere within the article for a given emotion category.

Emotional Amplification Index

EAI quantifies the difference in emotional intensity between the headline and article content. Two variants were defined:

(I) Article-Level Amplification:

$$EAI_{avg}(e) = E(H,e) - E(A,e) \tag{3}$$

where *H* denotes the headline, *A* denotes the full article body, $E(H,e)$ denotes the normalized emotion score of the headline for emotion category *e*, and $E(A,e)$ denotes the normalized emotion score of the full article body for emotion category *e*. A positive value of $EAI_{avg}(e)$ indicates that the headline carries greater emotional intensity than the article on average for that emotion category.

(II) Sentence-Level Amplification:

$$EAI_{max}(e) = E(H,e) - E_{\max}(A,e) \tag{4}$$

where $E_{\max}(A, e)$ denotes the maximum normalized emotion score observed across all individual sentences in article *A* for emotion category *e*, as defined in Equation (2). A positive value of $EAI_{max}(e)$ indicates that the headline exceeds even the most emotionally intense sentence in the article for that emotion category, providing a stricter criterion for emotional amplification.

Statistical Analysis

For each of the four emotion categories, namely anger, fear, joy, and sadness, the proportion of articles exhibiting positive emotional amplification values was computed. Additionally, mean amplification differences were calculated to evaluate the overall tendency of headlines to amplify emotional intensity relative to article-level content. EAI for each article was calculated as:

$$EAI_i = H_i - A_i \tag{5}$$

where EAI_i represents the emotional amplification score for the *i*-th article, H_i denotes the headline-level emotional intensity score, and A_i denotes the article-level emotional intensity score.

To statistically evaluate the significance of the observed emotional differences, paired t-tests were conducted between headline-level and article-level emotional intensity scores. The paired t-statistic was computed as:

$$t = \frac{\bar{d}}{s_d/\sqrt{n}} \tag{6}$$

where $\bar{d}$ represents the mean difference between paired emotional scores, s_d denotes the standard deviation of the paired differences, and *n* represents the total number of analyzed articles.

The mean emotional difference between headlines and articles was computed using:

$$\bar{d} = \frac{1}{n}\sum_{i=1}^{n}(H_i - A_i) \tag{7}$$

where $\bar{d}$ denotes the average emotional difference across the analyzed dataset.

Additionally, 95% confidence intervals were computed to assess the reliability and stability of the estimated emotional differences. The confidence interval was calculated as:

$$CI = \bar{d} \pm t_{\alpha/2}\left(\frac{s_d}{\sqrt{n}}\right) \tag{8}$$

where *CI* represents the confidence interval, $t_{\alpha/2}$ denotes the critical t-value at significance level $\alpha = 0.05$, s_d represents the standard deviation of paired differences, and *n* denotes the total sample size. Statistical significance was evaluated at a threshold of $p < 0.05$.

Results And Discussion

This section presents the results obtained from the emotional amplification analysis between news headlines and their corresponding article content. The analysis focuses on four emotional categories: anger, fear, joy, and sadness.

Experimental setup

All experiments were implemented in Python 3 and executed on Kaggle Notebook. The primary libraries used include NRCLex for emotion score computation and NLTK [16] for text tokenization and sentence segmentation. Pandas is used for data manipulation and SciPy for statistical testing. No GPU resources were required as all computations involved lexicon-based text processing. The random sample of 4,000 articles was drawn using a fixed random seed of 42 to ensure

reproducibility [17]. Statistical significance testing was carried out at a significance level of α = 0.05. Data preprocessing and dataset management were performed using the Pandas library, which provides efficient data structures and analytical tools for handling large datasets in Python (McKinney [18]).

Distribution of emotional amplification

To further analyze amplification behavior across articles, the distribution of EAI values for each emotion category is illustrated in Figures *3*-*6*. All four distributions exhibit a strong concentration of values near zero, indicating that in most cases headlines maintain emotional consistency with the article body.

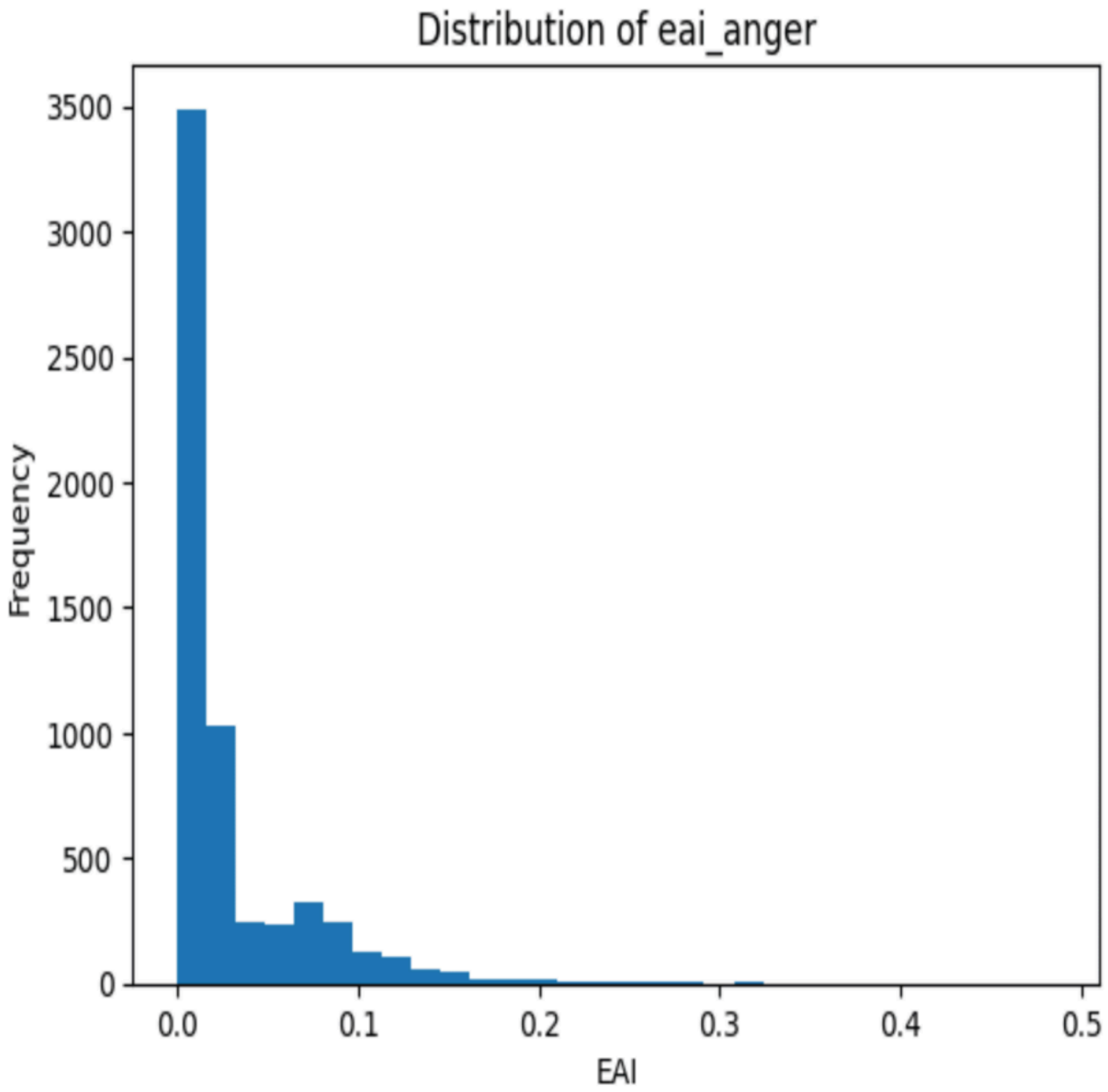


FIGURE 3: Anger Emotion Distribution

EAI, Emotional Amplification Index

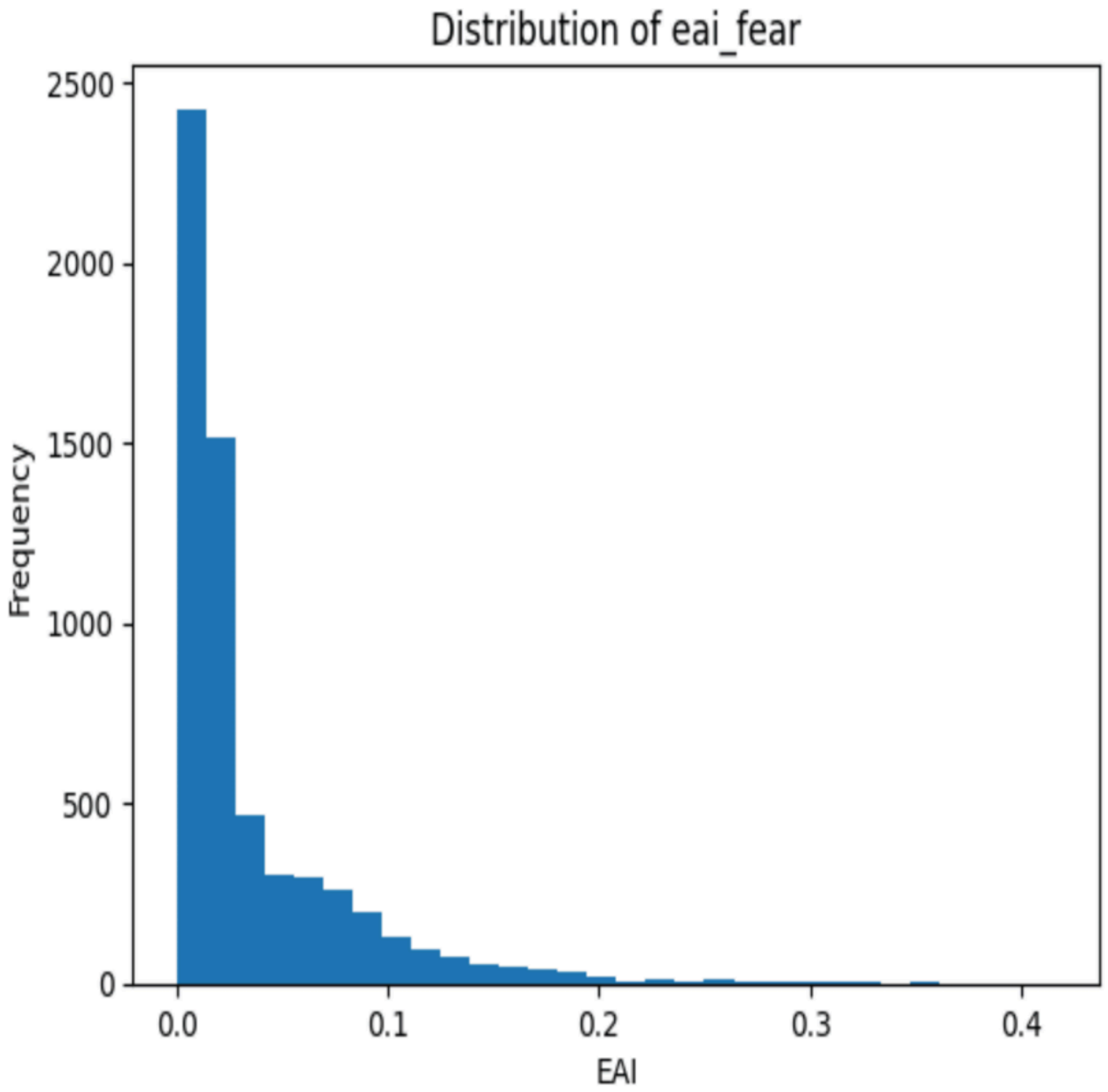


FIGURE 4: Fear Emotion Ditribution

EAI, Emotional Amplification Index

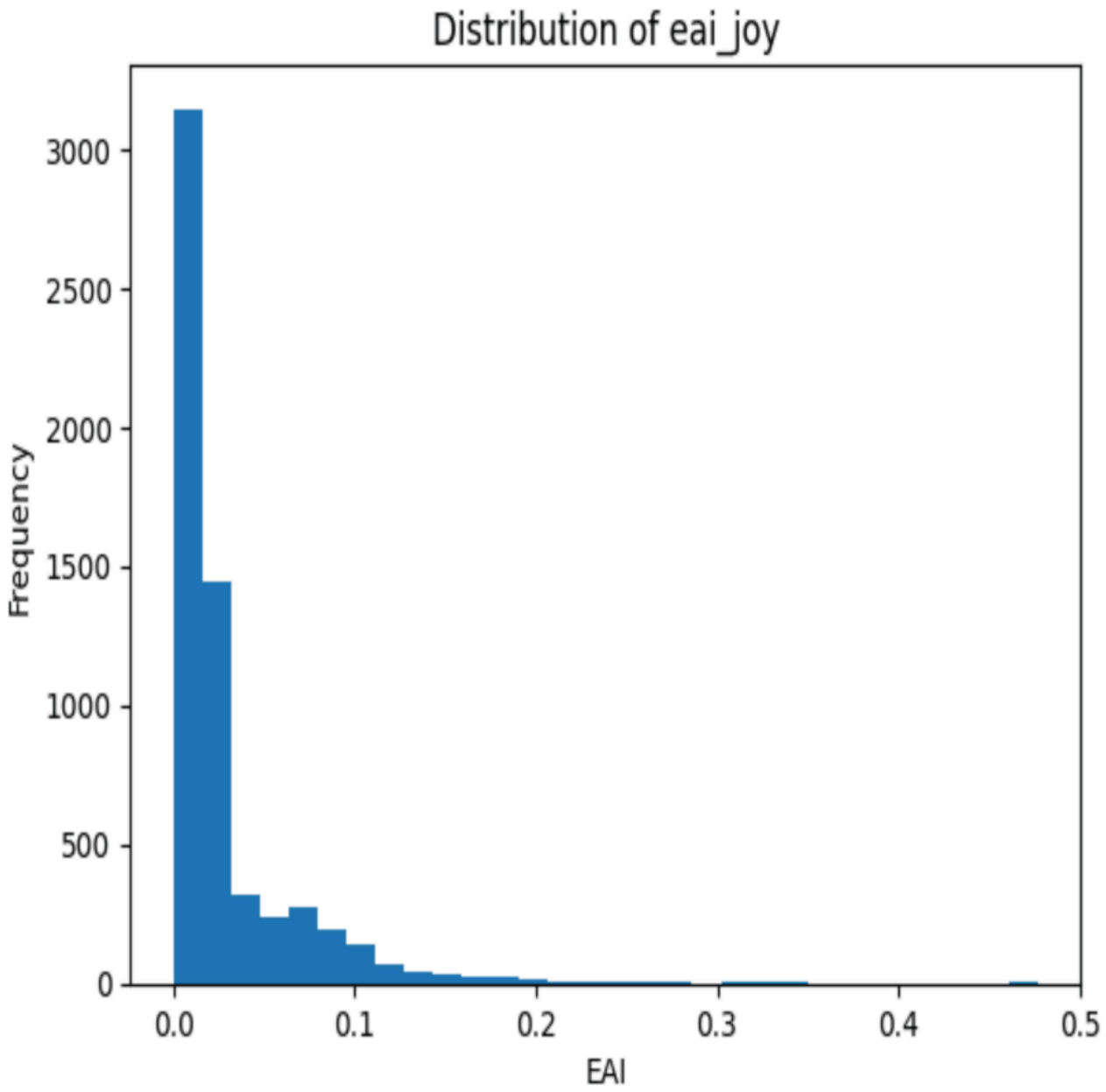


FIGURE 5: Joy Emotion Distribution

EAI, Emotional Amplification Index

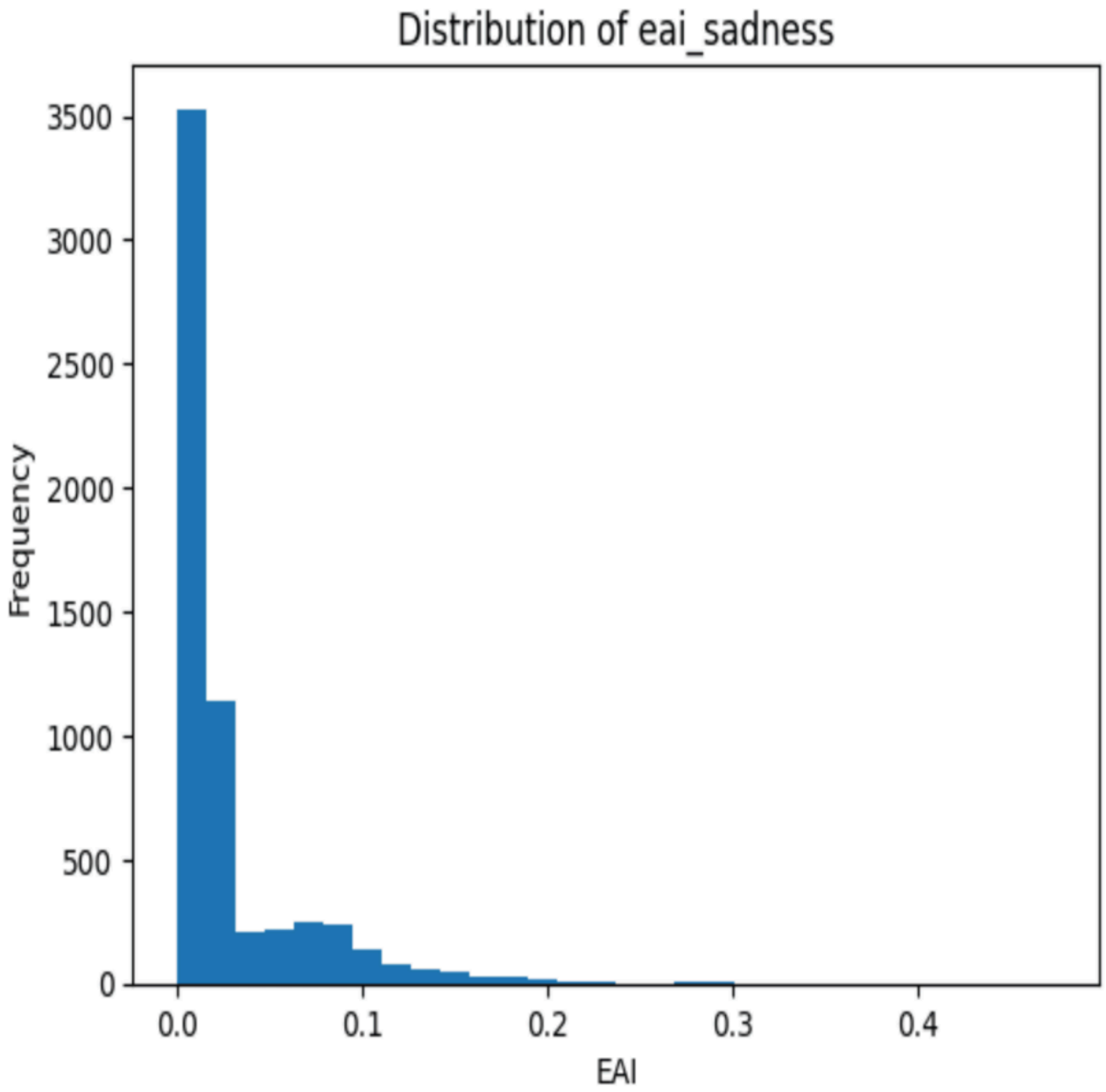


FIGURE 6: Sadness Emotion Distribution

EAI, Emotional Amplification Index

The distributions across all four emotions reveal that the majority of EAI values are concentrated near zero, indicating that most headlines closely match the emotional tone of their corresponding articles. However, a visible subset of articles exhibit EAI values exceeding 0.1, particularly notable in Figure *3* and Figure *4* (fear). This is suggesting that headlines of news articles selectively amplify these negative emotions more strongly than the article body. Figure *4* demonstrates the widest distributional spread, extending up to 0.4, confirming that fear-related language is most frequently and intensely amplified in headlines compared to other emotional categories. In contrast, Figure *5* (joy) displays a comparatively

narrower distribution, indicating that positive emotional amplification is less pronounced. Figure *6* (sadness) similarly shows a right-skewed distribution with most values clustered near zero, though occasional outliers extend beyond 0.3, reflecting sporadic but notable amplification of sadness-related language in headlines.

Headline vs article-level emotional comparison

The percentage of articles in which the headline emotion was higher than the emotion at the article level was calculated to measure the degree of emotion amplification as compared to the whole article.

The comparison of headline-level and article-level emotional scores shows that the emotional amplification takes place in all the four emotion categories but with different level of frequency. Fear is the most intensified emotion, as it is used in around 26.43% of the reviewed articles. The case of anger is increased in 22.62% and then sadness in 20.30% of the articles. Joy has the minimum rate of amplification, which is found in 19.48% of articles.

These findings suggest that emotional cues of fear are most commonly exaggerated in headlines as compared to the general tone of the article. A similar observation is made in the work [9]. The observation is consistent with the previous studies that have proposed the notion that negative or threat-related language can be more attractive to readers.

Headline vs maximum sentence-level emotion

Although headlines seem to be more emotional than the entire article, the question that needs to be looked at is whether the headlines surpass the emotional strength of the most emotionally colored sentence in the article. To handle this, the scores of emotion were calculated on a sentence level, and the highest score of emotion on a sentence level was obtained in each article.

The sentence-level analysis also shows that the amplification of the most emotionally intense sentence in the article is less common. Fear once again has the highest rate of amplification with headlines out of the fearfulness of the article being over 13.87%. Anger is next followed by amplification, which is seen in the cases of 13.07%. The rates of sadness and joy are lower, 11.43% and 10.53% in the articles, respectively.

These findings confirm that though headlines often have a high emotional response compared to the average emotion of the article, they seldom go beyond the emotional response of the most emotionally intense sentence in the article. This implies that the information that is emotionally salient in the article is often brought to the fore in the headline and not that the article introduces entirely new emotional framing.

Figure *7* shows comparision between article level and max emotionally charged level EAI.

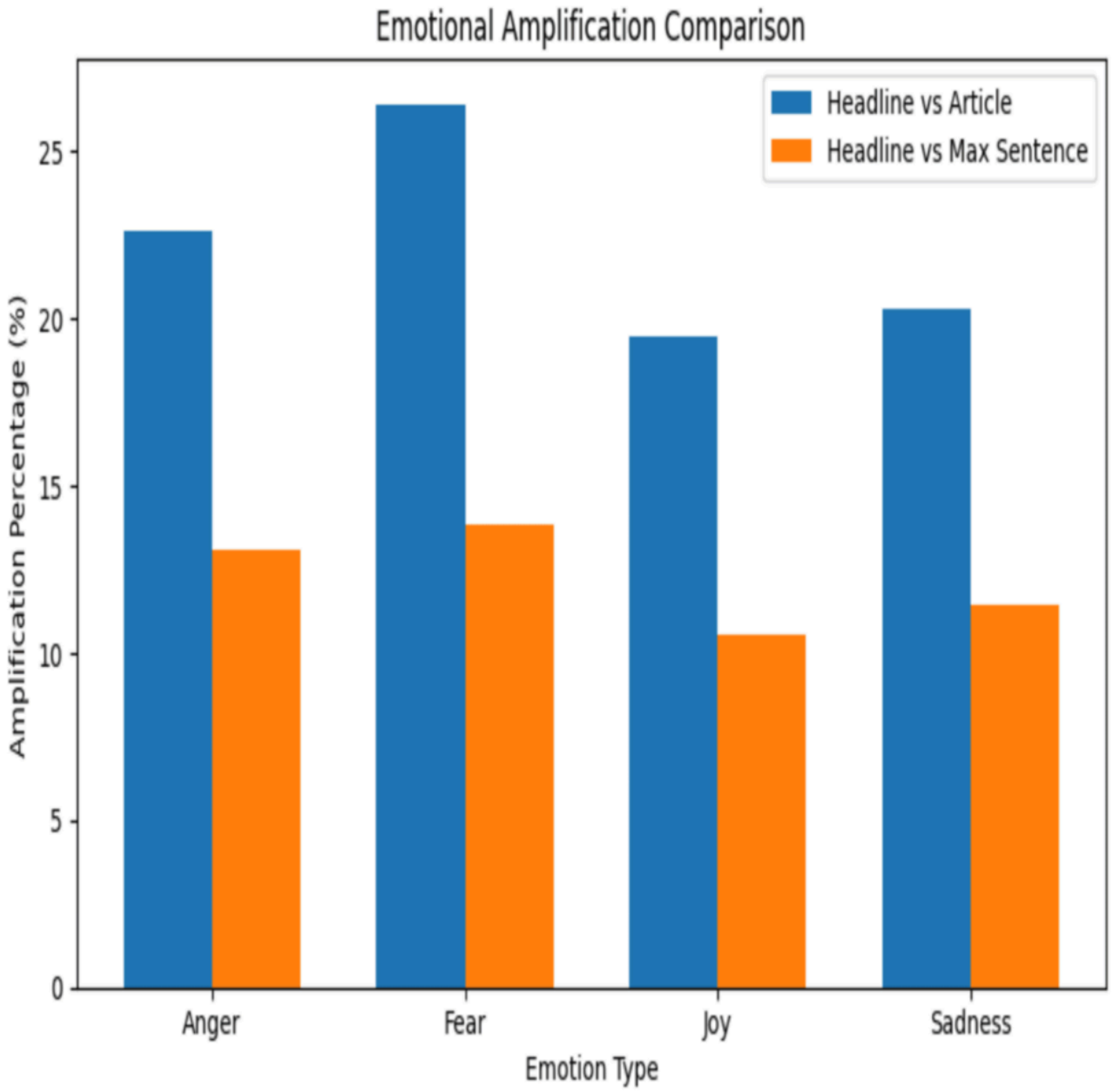


FIGURE 7: Emotional Amplification Index Comparision Between Article and Max-Sentence

Statistical validation of emotional differences

To further evaluate the statistical significance of the observed emotional differences between headlines and article-level content, paired statistical analysis was conducted. Table *1* presents the obtained statistical measures including mean difference, t-statistic, p-value, and confidence interval.

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Statistical Measure	Obtained Value
Mean Difference	-0.3225
t-statistic	-28.1192
p-value	<0.001
95% Confidence Interval	(-0.3450, -0.3000)

TABLE 1: Statistical Comparison Between Headline and Article Emotional Intensity

The obtained statistical measures demonstrate that the emotional differences observed between headlines and article-level content are statistically significant and consistently reproducible across the analyzed dataset. While Table *1* presents the computed statistical values obtained from the paired analysis, Table *2* provides the purpose and interpretation of each statistical measure within the context of emotional amplification analysis. These findings further strengthen the validity and reliability of the proposed EAI framework for evaluating emotional framing patterns in news headlines.

Statistical Measure	Purpose in the Study	Interpretation of Obtained Result
Mean Difference	Used to measure the average emotional difference between headlines and full articles across the analyzed corpus. It helps determine whether headlines systematically differ in emotional intensity from article content.	The obtained mean difference of -0.3225 indicates a substantial emotional difference between headlines and article-level content, confirming that headlines do not perfectly mirror the emotional tone of the complete article body.
t-statistic	Used to determine the strength of the observed emotional difference relative to natural variation within the dataset. Larger absolute values indicate stronger statistical evidence.	The obtained t-statistic of -28.1192 represents an extremely strong statistical effect, showing that the emotional differences observed between headlines and articles are highly unlikely to occur due to random variation alone.
p-value	Used to evaluate whether the observed emotional differences are statistically significant or simply caused by chance.	The obtained result of $p < 0.001$ confirms that the emotional differences between headlines and articles are statistically highly significant, indicating extremely strong evidence against random occurrence.
95% Confidence Interval	Used to evaluate the reliability, stability, and consistency of the estimated emotional difference across the analyzed dataset.	The obtained confidence interval of (-0.3450, -0.3000) demonstrates that the observed emotional difference remains consistently stable across the corpus and does not approach zero, further confirming the robustness of the findings.

TABLE 2: Interpretation of Statistical Measures

These statistical findings further confirm the reliability and significance of the observed emotional amplification patterns across the analyzed news corpus.

Qualitative analysis of high-amplification cases

To better understand how emotional amplification manifests in practice, two representative examples with high fear amplification are examined.

Example 1:

Headline: Investors flee risk as bear markets multiply: BAML

Headline Fear Score: 0.375
Max Sentence Fear Score: 0.045
Fear Amplification: 0.329

Most Fearful Sentence:

BAML strategists also noted more than half the stocks in MSCI's world index (1,254 out of 2,273) are in bear territory.

In this example, the headline compresses several emotionally charged financial terms such as "flee", "risk", and "bear markets". This produces a significantly higher emotional density compared to the article sentence, which conveys the same information in a more descriptive and contextual manner.

Example 2:

Headline: Destination Maternity files for bankruptcy

Headline Fear Score: 0.400
Max Sentence Fear Score: 0.071
Fear Amplification: 0.329

Most Fearful Sentence:

If it is unable, it will likely be forced to liquidate, the person said.

Here, the headline emphasizes the critical outcome "bankruptcy", which carries strong negative financial implications. In contrast, the article sentence distributes emotional signals across a longer explanatory structure, reducing its normalized emotional intensity.

In general, these instances demonstrate that emotional amplification in headlines is frequently caused by lexical compression and emphasis on the emotionally salient words and terms, as opposed to the presentation of the completely new emotional stories.

Combined, the quantitative and qualitative results indicate that headlines are summarized versions of news articles that summarize the emotional content. Although the amplification of the headlines as compared to the article averages is a normal occurrence, the headlines tend to be consistent with the most emotionally charged parts of the article material.

Limitations

In the current study, a lexicon-based emotion detection framework is used, with its methodological limitations. The NRC Emotion Lexicon is word-based and relies on the associations of emotions with words, which does not adequately reflect contextual semantics, negation, sarcasm, or irony or compositional linguistic structures. The limitation is especially important in the case of short-form textual content, like news headlines, where emotional interpretation can be heavily dependent on the textual context, such as phrasing.

Furthermore, the dataset used in this study is not manually labelled with emotions, so it is not possible to directly evaluate the accuracy of the classifications. Thus, the emotion ratings that have been assigned to a given text might have some error or systematic error.

Despite such constraints, the lexicon-based methods offer interpretable, transparent, and efficient means to statistically analyze the density of emotions in large sets of news articles. Future work can include the use of transformer-based contextual models like BERT or RoBERTa to test the proposed EAI and to further develop it by applying context-aware emotion representations.

Conclusions

This research proposed a tool called EAI to examine emotional differences between headlines and article content in the four emotions of anger, fear, joy and sadness. The results indicate that in almost one-fifth to one-quarter of the analyzed articles the headlines included emotionally heightened language in comparison to the article content. When juxtaposed, however, with the most emotionally charged part of the article, the amplification effect is not as strong, suggesting that headlines do not always create a new emotional context, but instead highlight parts of the text already emotionally charged. Of all the emotions, fear was the one with the highest prevalence on amplification, suggesting a higher level of

framing in the construction of headlines that relate to threat. The statistical analysis also showed that the difference between the emotional content of the headlines and the content in the articles is indeed highly statistically significant and reproducible across the analyzed texts.

Future research could extend this study by incorporating transformer-based contextual emotion detection models such as BERT or RoBERTa to capture semantic nuances beyond lexicon-based approaches and benchmark the proposed EAI against context-aware classification techniques. Additionally, analyzing emotional amplification across different news outlets, political domains, and time periods may provide deeper insights into media framing patterns. Another promising direction involves examining the relationship between emotional amplification and reader engagement metrics such as click-through rates or social media interactions or engagement.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Jeet N. Desai, Manjunath L. Honamore

Acquisition, analysis, or interpretation of data: Jeet N. Desai, Manjunath L. Honamore

Drafting of the manuscript: Jeet N. Desai, Manjunath L. Honamore

Critical review of the manuscript for important intellectual content: Jeet N. Desai, Manjunath L. Honamore

Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Data Availability Statements

The datasets (and/or code) supporting this study are available from the corresponding author upon reasonable request.

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