

Emotional Reframing of Economic News using a Large Language Model

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News media framing can shape public perception and potentially polarize views. Emotional language can exacerbate these framing effects, as a user’s emotional state can be an important contextual factor to use in news recommendation. Our research explores the relation between emotional framing techniques and the emotional states of readers, as well as readers’ perceived trust in specific news articles. Users ($N = 200$) had to read three economic news articles from the Washington Post. We used ChatGPT-4 to reframe news articles with specific emotional languages (Anger, Fear, Hope), compared to a neutral baseline reframed by a human journalist. Our results revealed that negative framing (Anger, Fear) elicited stronger negative emotional states among users than the neutral baseline, while Hope led to little changes overall. In contrast, perceived trust levels varied little across the different conditions. We discuss the implications of our findings and how emotional framing could affect societal polarization issues.

CCS Concepts: • **Human-centered computing** → *Empirical studies in HCI*; • **Computing methodologies** → *Natural language generation*.

Additional Key Words and Phrases: Emotional Framing, Societal Polarization, News Credibility, Persuasive Technologies

ACM Reference Format:

Jia Hua Jeng, Gloria Anne Babile Kasangu, Alain D. Starke, and Christoph Trattner. 2024. Emotional Reframing of Economic News using a Large Language Model. In *Adjunct Proceedings of the 32nd ACM Conference on User Modeling, Adaptation and Personalization (UMAP Adjunct '24)*, July 1–4, 2024, Cagliari, Italy. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3631700.3665191>

1 INTRODUCTION & BACKGROUND

Framing in news media can significantly influence public understanding and response to specific topics, such as economics and climate change. News Framing or Media Framing usually involves the use of language that shapes information delivery and the reader’s opinion formation [4, 11]. Particularly surrounding controversial societal issues, stakeholders sometimes aim to leverage the news media to sway people’s sentiments to align their stances by framing emotions, which can create distinct groups and further polarization [1, 4].

A particular concern are news frames that journalism apply to emphasize specific perspectives while potentially omitting others. This can influence readers’ emotional states, shape opinion formation, and ultimately contribute to societal polarization [4, 18, 20]. They act as storylines providing meaning to specific events [11], converting ambiguous controversies into understandable narratives. Journalists apply them to efficiently classify, shape and distribute information, with the framing process influenced by both conscious and unconscious factors [28]. For instance, framing economic growth positively correlates with increased policy support [13].

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Manuscript submitted to ACM

Emotion is often overlooked as a contextual factor in user modelling [29]. Be it from the provider's side (i.e., a news article headline), or from the user's state (i.e., adapting content to a user's emotional state), it requires the attention of user modellers. For example, presenting depressing headlines to an overjoyed person might not boost user satisfaction, while overemphasizing emotions in modelling might lead to an 'emotion echo chamber' [30]. In this paper, we examine how emotional re-framing using an LLM affects user perceptions of news articles, being a pre-cursor for a later study on news recommendation.

The role of emotion in news framing is attracting more attention in journalistic practices. Emotion acts as the frame in different issues and can give the privilege for specific information in accessibility, which directs subsequent decision-making processes [23]. For instance, one study highlights that angry news framing in a cell phone battery explosion context, leads to less news consumption and more negative attitudes toward the production company from readers [17]. Furthermore, 'fear' can be identified as a significant factor. Research suggests that emotions like fear and anger, specifically in relation to drunk driving, tend to increase the desire for both retributive and protective information, compared to gun violence issue [23].

Opinion formation is significantly influenced by the emotional content in news framing, which affects decision-making and types of opinions formed [20, 23, 25]. Emotions alter the persuasive effect of messages based on the emotional framing [12, 20]. For example, a study found that experiencing sadness can spark altruistic actions and enhance empathy for the victims [3, 7, 22]. This aligns with findings where 'anger' led to information on stricter punishments, 'fear' sought preventive methods, and 'hope' inclined towards optimistic outcomes [9, 20]. Our research focuses on fear, anger, and hope as crucial emotions due to their influence in shaping opinions and mediating the effect of news framing on decision-making.

Furthermore, polarization triggers a cyclical process leading to reduced communication among diverse groups [31]. The manner in news framing can potentially amplify this polarization effect [1, 4, 8]. For example, one study regarding social media showed that users exposed to negative emotional tweets perceive a more significant ideological distance between presidential candidates and their respective parties [2].

In light of the AI surge in the journalism sphere [16, 24], our research adopts an innovative approach, distinct from traditional, manual framing methods. We harness ChatGPT-4 from OpenAI, a Large Language Model (LLM), to explore its potential in reshaping news framing and influencing public opinion. Recent research indicates that such models have the capability to generate complex narrative structures, mimicking human-like writing in news articles, which are challenging for readers to distinguish who wrote the news articles [5]. The advanced text generation capabilities of these models allow for widespread and automated use with regard to reframing. Our research applies ChatGPT to reframe news articles, offering a novel perspective in analyzing societal issues, such as polarization. We focus on three primary affective frames: (a) 'anger', (b) 'fear', and (c) 'hope'. The primary goal is to determine how affective frames can influence users' emotional states and the trust of news articles.

Our research provides a comparative analysis of news framing and its influence on emotional states and perceived trust. We have identified essential gaps in the current literature: (1) There is a lack of comprehensive understanding regarding the impact of emotional reframing, particularly through LLM models, such as ChatGPT-4, on the emotional states from news consumers; (2) The nuanced insights between various emotional framing styles, such as Anger, Fear, Hope and Neutral, and their effect on the perceived credibility of news articles is not well uncovered. Consequently, our study poses essential reaserch questions:

- RQ1: To what extent do different affective news frames affect emotional states among readers?

- RQ2: How do the different cues/variables in news articles affect users' perceived trust?

The structure of this paper is as follows: In Section 2, we describe the methodology involving data collection and the research procedure with the application of ChatGPT-4 for news framing. Our findings are in Section 3, and each subsection focuses on research questions regarding emotional shifts and news credibility. In Section 4, we discuss the implications of these findings and the potential influence of AI on journalism. Finally, Section 5 concludes the paper by summarizing primary insights and outlining directions for future research.

2 METHODS

2.1 Materials & Research Design

We set up a research platform for presenting economic news articles to participants¹. We examined the shift in users' emotional states and trust for news articles, employing news articles from the Washington Post opinion section [32]. Our study was subject to four different news article conditions, which each represented distinct emotional frames: Anger, Fear, Hope, and Neutral. Please refer to the footnote to inspect the prompts of our study².

We selected three news articles related to national affairs. For the Anger, Fear, and Hope conditions, we summarized and emotionally reframed each news article using OpenAI's multimodal Large Language Model, GPT-4. The neutral condition featured a news article reframed by a journalist. For the study website, we used JavaScript, HTML, CSS for the frontend, and Django with Python for the backend, integrating Washington Post content.

2.2 Participants & Procedure

For our study, a total of 200 US-based participants ($M_{age} = 41.16$, $SD = 13.98$, 53.5% males) were recruited from the crowdsourcing platform Prolific. Only participants who were fluent in English and with an approval rate on Prolific of at least 98% were selected and compensated with 1.20 GBP for their participation in our 8-minute study.

After disclosing demographics, we inquired on participants' current emotional states in terms of Anger, Fear, and Hope. Subsequently, we presented three news articles from our dataset, of which examples are depicted in Figure 1. Participants read specific news articles and thereafter assessed their emotional states, evaluated the influence of the articles' titles and content on their emotions and their trust in the presented information. An attention check was included in the questionnaire evaluating the first news article.

2.3 Measures

2.3.1 Discrete Emotion Scales and Perceived Trust. The questionnaire included items measuring participants' current emotional states, before and after the study. We assessed feelings of anger, fear, and hope using 5-point Likert scales. Moreover, we measured to what extent reader trusted the news articles in the post-test.

- *Anger scale.* The Anger scale ('angry', 'hostile', 'irritable') was constructed to correspond to the first three adjectives in the Hostility scale of the PANAS-X Manual for the Positive and Negative Affect schedule [33]. In the original Hostility scale in PANAS-X, the scale of Hostility includes of 6 adjectives, however for the purposes of our study, only the three were selected to reasonably represent the construct of anger.

¹This research adhered to the ethical guidelines of the Research Council of [Country] and the guidelines of [University] for scientific research. The study was judged to pass without further extensive review, for it contained no misleading information, stress tasks, nor would it elicit extreme emotions

²The prompts used in ChatGPT-4: https://anonymous.4open.science/r/ChatGPT_Prompting_Emootional_Frames-7494/README.md

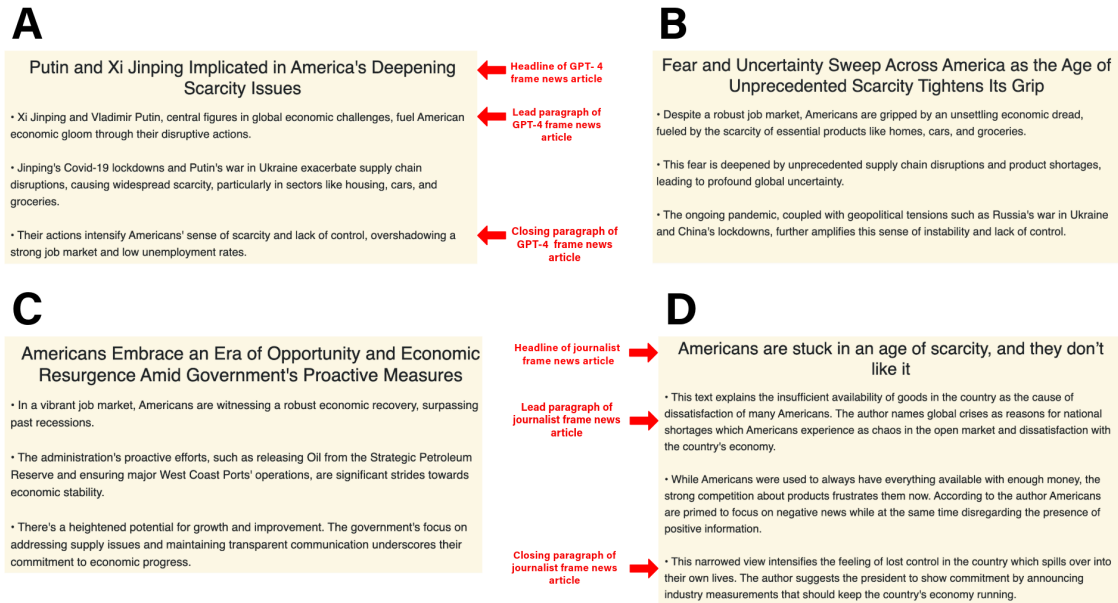


Fig. 1. Four examples of reframed news articles. (A) Depicts a GPT-4 *anger*-framed article, (B) a GPT-4 *fear*-framed article, (C) a GPT-4 *hope*-framed article, and (D) an article summarized by a journalist (*neutral* frame).

- *Fear scale.* The Fear scale ('fear', 'anxiety', 'faint-hearted') was adapted from a measure used in a study by Kühne and Schemer [20] on the emotional effects of news frames. This scale was specifically chosen for its relevance to the unique aspects of fear framing explored in our study.
- *Hope scale.* The Hope scale ('hope', 'proud', 'joyful') included elements from both the Joviality and Self-assurance scales in the PANAS-X, with the addition of the custom item 'I feel hope'. This item was specifically constructed to gauge the subjective state of hope experienced by the individual [6], addressing a dimension not explicitly covered in the PANAS-X scales.
- *Perceived Trust.* The statement 'I trust the content of the news article' was used to measure the perceived credibility of news articles, as a proxy for perceived trust [14].

2.3.2 *Manipulation Check.* We checked the changes made by the LLM by performing a sentiment analysis on the four different conditions using 'Vader'. It shows that the Anger and Fear re-frames only used negative words, while hope only consisted of positive words. The Neutral journalist frame had a mix of positive and negative words, leaning slightly towards negative sentiment. A Tukey post-hoc test following a between-subjects ANOVA indicated that the following differences were significant: the text sentiment scores between the 'Anger-Journalist' ($p < 0.01$), 'Fearful-Journalist' ($p < 0.01$), and 'Hope-Journalist' ($p < 0.01$). Conversely, no significant variation was found in the 'Fearful-Anger' response ($p > 0.05$), aligning our findings with a tendency towards negative words. In addition, sentiments depicted in the words of titles are similar to news text, and there are significant differences between the groups ($p < 0.01$).

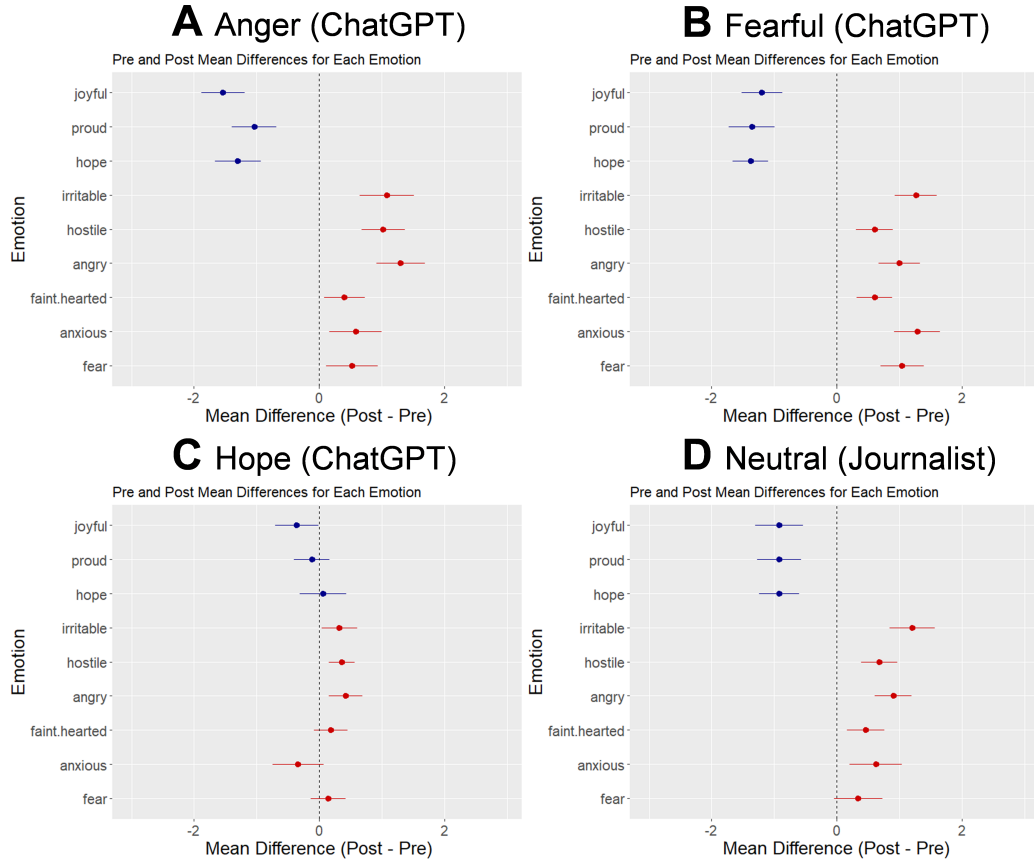


Fig. 2. Pre-Post differences (means and std. errors) for nine different emotional states across the four conditions in this research.

3 RESULTS

We analyzed pre-post differences for nine emotional states, across four emotional reframing conditions: Neutral (journalist), and Anger, Fear and Hope (ChatGPT-4) (RQ1). Additionally, we evaluated the perceived credibility of news across these four conditions (RQ2).

3.1 RQ1: Changes in Emotional States

Overall, our results indicated that the negative framing (Anger, Fear) from Chat-GPT led to stronger negative changes in emotional states than those triggered in the human journalist condition. In contrast, the emotional state in the Hope condition was hardly affected. These changes are depicted in Figure 2). Even though we expected no changes in the neutral condition, it seemed that reading a news article had a negative ‘baseline effect’ on one’s emotional state. This was exacerbated in the angry and fearful conditions, but reduced in the hope condition.

3.1.1 Anger Condition (A). The Anger condition significantly increased the negative emotional states, with the mean differences of anxiousness, anger, hostility, and irritability ($p < 0.01$). Fear and faint-heartedness also increased significantly ($p < 0.05$). In contrast, positive emotions notably decreased, with hope, pride, and joyfulness ($p < 0.01$). These results indicated a trend toward increased negative emotions, which aligned with related work that showed how anger reduces news engagement and fosters negativity [17].

3.1.2 Fear Condition (B). The Fear condition significantly increased all negative emotional states ($p < 0.01$). Conversely, it led to decrease in positive emotional states, with a notable drop in hope, pride, and joyfulness ($p < 0.01$). This suggested that users' emotional state was negatively affect, which aligned with a previous study that showed how reading negative tweets tended to increase readers' adverse emotional states [27].

3.1.3 Hope Condition (C). The Hope condition showed a distinct emotional shift. There was a significant rise in anger, hostility, and irritability ($p < 0.05$), whereas fear, anxiousness, and faint-heartedness did not change significantly. Interestingly, in positive emotions, hope remained stable ($p = 0.746$), pride depicted a non-significant drop ($p = 0.402$), and joyfulness decreased significantly ($p = 0.040$). This suggested that, in general, the emotional shift in Hope condition remains stable.

3.1.4 Neutral Condition (D). The Journalist condition, serving as a baseline, presented a lower negative emotion shift than anger and fear conditions. However, there was still a significant increase in all negative emotional states ($p < 0.01$), except for fear ($p > 0.05$). Regarding positive emotions, it showed a notable decrease in hope, pride, and joyfulness ($p < 0.01$). This indicated that the overall emotions shifted toward negativity in the journalist's condition.

3.2 RQ2: Credibility of news frames between ChatGPT and Human Journalist

We further examined differences in perceived trust across the journalistic and ChatGPT frames. Firstly, we performed an ANOVA analysis which revealed significant differences among the four conditions. Consequently, we conducted a corresponding Tukey post-hoc analysis. Interestingly, the results indicated no significant differences between the journalist neutral frame and the ChatGPT frame, indicating that study participants trusted the frames of machines and humans to the same degree [5]. The only difference found was between the fearful and angry frames, with fearful being perceived as more trustworthy than angry (see Figure 3).

4 DISCUSSION

Our study explores the affective framings between ChatGPT-4 and human journalists, highlighting how these frames affect the reader's emotional states and the credibility of news articles. This study is pioneering in shedding light on the power of Large Language Models (LLMs) to reframe news and shift emotional states. Our findings contribute to better understanding of the effects of news framing and polarization in news. The following are the insights from emotional states (RQ1) and credibility of news articles (RQ2). The results in RQ1 revealed that when people read the news from different frames, their emotional states had a significant shift, in line with the study mentioning the news frames affect readers' emotional states or attitudes [15, 27]. The results show that the negative framing (Anger, fear) framed by ChatGPT led to a more negative emotional state than the Journalist, which could be that the Journalist was framing in a neutral way to prevent biases. This outcome is in line of one study discussing journalistic professionalism, which suggests a neutrality and non-bias in journalistic practice [10]. Interestingly, Hope remained stable and did not reach the statistical significance on alteration of emotional states while still increasing the negative emotions. This

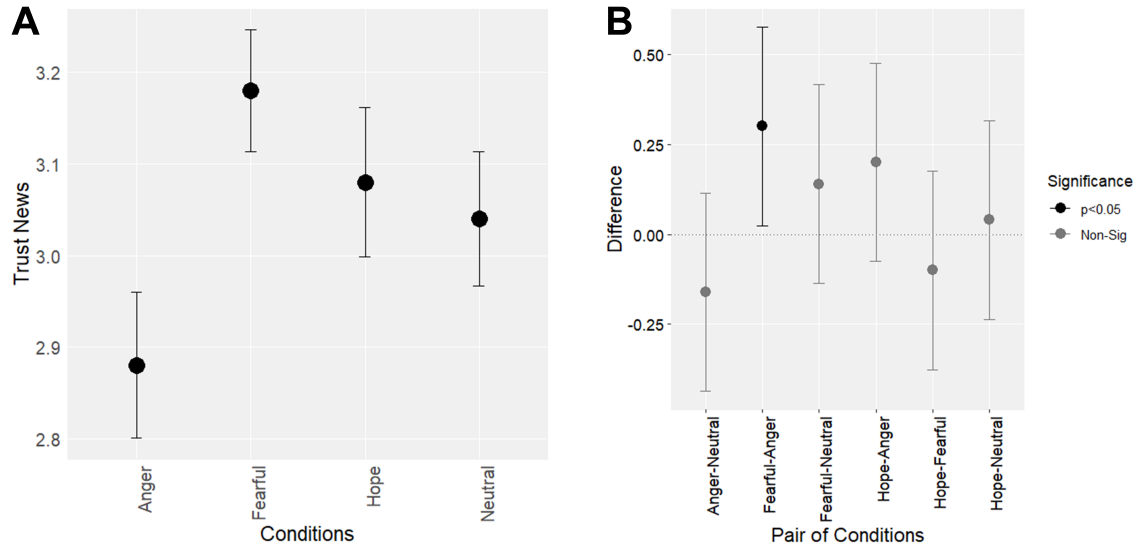


Fig. 3. (A) Average levels of perceived trust in news per condition. (B) Pairwise comparisons between conditions, based on a post-hoc Tukey test. Scale: 1 (Strongly Disagree) – 5 (Strongly Agree) . All error bars depict 1 S.E.

could be that Hope is a complex, mixed emotional state, which contains both positive anticipation and underlying distress; one study shows that Hope is a complex feeling involving optimism and anxiety about what the present might imply for the future [21].

Regarding RQ2, the study discovered that readers' level of trust in news written by ChatGPT and human journalists was similar. This suggests that people trust news sources regardless of who writes the articles. One explanation for this finding is that ChatGPT can imitate human writing styles, making it difficult for readers to distinguish between them [5]. However, the emotions in affective framing by ChatGPT play a crucial role in determining whether users trust news articles. Particularly, the study found that the fearful condition had a statistically significant effect on trust compared to the anger condition.

These findings regarding affective framing could play a role in exacerbating issues of polarization. We firstly found that different affective frames used in news articles can significantly influence emotional states, which could further contribute to polarization in our society [8]. Secondly, our findings indicate no significant difference between the framing of news by ChatGPT and human journalists regarding the credibility of news. This finding is consistent with another article, which suggests that news content generated by artificial intelligence is similar to that created by humans [19]. This study highlights the potential of affective framing by AI, such as ChatGPT, to amplify societal polarization through its impact on readers' emotional states and trust in news. Some emotional reframes may have a large impact in specific forms of communication. For example, the use of fear appeals may be effective when engaging in climate communication [26].

5 CONCLUSIONS & FUTURE WORK

This research indicates that affective framing significantly influences the readers' emotional states and news trust. This is regardless of whether ChatGPT or human journalists were involved in reframing the news article. Although the perceived trust is rather similar across AI and Journalist reframing strategies, the emotional context—particularly fear and anger—significantly alters emotional states, which may potentially intensify societal polarization. These findings emphasize that it is crucial to consider framing effects and potential polarization in journalism under the surge of AI.

Our study is subject to some limitations. First, we have not considered the images used in the news articles. Generative AI is also able to adapt and possibly 'reframe' news imagery with a persuasive intent. Future research could include a multi-model reframing strategy, including text and imagery. Second, we have focused only on the short-term effects of news framing within an 8-minute user study, which means we may have overlooked the longer-term impacts on readers' emotions. Since we have only used The Washington Post as a news source, our findings may not represent broader media biases.

Our forthcoming research will examine the effects of emotional framing on engagement with news media and the potential impacts on users' behavior. Additionally, we will investigate image attraction factor, investigating how intertwining visual elements and text content affect reader perceptions. Moreover, to enhance the comprehensiveness of our results, future research could benefit from a longer-term analysis for the changes in user behaviors and a more diverse range of news sources.

ACKNOWLEDGMENTS

This work was in part supported by the Research Council of Norway with funding to MediaFutures: Research Centre for Responsible Media Technology and Innovation, through the Centre for Research-based Innovation scheme, project number 309339.

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