

REVIEW ARTICLE

AN EXPLORATORY STUDY OF HOW EMOTION TONE PRESENTED IN A MESSAGE INFLUENCES ARTIFICIAL INTELLIGENCE (AI) POWERED RECOMMENDATION SYSTEM

Kelvin Leong*, Anna Sung

Chester Business School, University of Chester, Parkgate Rd, Chester, CH1 4BJ, UK
*Corresponding Author Email: k.leong@chester.ac.uk | ORCID 0000-0002-5896-0181

This is an open access article distributed under the Creative Commons Attribution License CC BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ARTICLE DETAILS

Article History:

Received 23 August 2023
Revised 28 September 2023
Accepted 14 October 2023
Available online 16 October 2023

ABSTRACT

This innovative study aims to explore how emotion tone presented in a message influences the judgement of Artificial Intelligence (AI) bots. We established a scenario by using vacation rental introduction as input message to conduct experiments to explore the influences. Our findings suggest that AI bots demonstrate preferences on the input message presented in positive tones rather than input message with negative tones. Our pioneering study can serve as a crucial starting point for future studies, in particular opening up fresh avenues for future research endeavours and engenders discussions and debates concerning the development of recommendation system.

KEYWORDS

Recommendation system, Artificial Intelligence, Emotion tone, Signalling theory, AI bots, AI participants

1. INTRODUCTION

Artificial Intelligence (AI) powered recommendation systems are becoming increasingly important in the business world as they allow marketers to provide potential customers with relevant product recommendations in real-time (Straits-Research, 2022). In fact, recommendation system is an emerging market. According to previous study (Straits-Research, 2022), the global recommendation engines market is projected to reach USD 54 billion by 2030, from USD 3 billion in 2021, and is anticipated to register a CAGR of 37% during the forecast period (2022–2030) while the growing adoption of digital technologies among organizations is resulting in the increased demand for recommendation engine solutions (Grand-View-Research, 2021).

In the age of big data, where there is an overload of information available in the market, potential customers rely on recommendations to help them make decisions. Recommendation systems are becoming increasingly important in the business world as they help customers find the products they are looking for faster and more efficiently (Nilashi et al., 2021). Therefore, better understanding the mechanism of how AI-powered recommendation make recommendation could help businesses to gain competitive advantages.

We argue that the emotion tone conveyed in an input message to an AI system can influence the system's judgment, and as a result, the emotion tone would influence how the AI system generates recommendations. We established a scenario by using vacation rental introduction as input message to conduct experiments to explore the influences. Vacation rental introduction refers to an engaging description that provides prospective guests with a comprehensive understanding of the vacation rental property. Although the vacation rental introduction primarily serves to provide information about the rental property, it includes descriptive language that can convey emotional tones and engage the reader's emotions. For example, the use of words like "dream," "serene," or "unforgettable" can evoke positive emotions, while phrases such as "limited availability" or "book now" may create a sense of urgency or

excitement. Therefore, we employed vacation rental introduction in this study as input message for assessing whether AI bots exhibit different behaviors or responses based on emotional cues. On the other hand, this study employed three state-of-art AI bots (ChatGPT, Google BART, Microsoft Bing) as participants in the experiments. These AI bots are trained using vast amounts of data, allowing them to generate responses that are so authentic that people cannot distinguish them from human responses (Carvalho & Ivanov, 2023; Gursoy et al., 2023).

Currently, there is a lack of related studies that specifically investigate whether AI bots would yield different ratings based on input message presented in varying emotional tones. This research gap highlights the need to explore how AI bots interpret and assess emotional cues within input messages and whether these cues influence their ratings. Understanding the potential variations in AI bot evaluations based on emotional tones can help content creators to design message preferred by AI powered recommendation system, and then enhance business results. Further research in this area will also contribute to a more comprehensive understanding the relationship of emotional tones presented in input message and judgement made by AI recommendation system.

The rest of this paper is organised as follows: we first review the relevant theories and emotion tones classification in previous studies in the next section, followed by a systematic discussion on the methodology behind of our experiment. In the finding and analysis section, we summarise and report the findings. Finally, further discussion and suggestions are provided in the Conclusion section.

2. LITERATURE REVIEW

Signalling theory is the key theoretical foundation behind the suggestion that emotion tone conveyed in an input message to an AI system can influence the system's judgment. We also designed and conducted experiment to evaluate the influence by convey an input message into six emotion tone according to the classification proposed by Shaver et al. (1987). Relevant literatures are critically discussed and reviewed as follows

Quick Response Code



Access this article online

Website:
www.jtin.com.my

DOI:
[10.26480/jtin.02.2023.72.76](https://doi.org/10.26480/jtin.02.2023.72.76)

2.1 Signaling Theory

Signaling theory focuses on how signals or cues are used to convey information to receivers and influence their decision-making processes (Connelly et al., 2010; Karasek & Bryant, 2102). The theory has widely been studied in many disciplines, such as accounting (Wang et al., 2009), management (Taj, 2016), human resource management (Suazo et al., 2009), tourism (Zhu & Wang, 2022), healthcare (Liu et al., 2022), marketing (Dunham, 2011), etc.

From the lens of signalling theory, previous studies had reported the impacts of emotional tone in communication. For examples, Zhu and Wang (2022) proposes the hypothesis that government microblogging impacts the value of the tourism market by influencing the emotions of consumers. (Belkin et al., 2013) examines how individuals perceive power in negotiations. It focuses not only on the control of tangible resources but also on how dominance is expressed through emotional language in electronically mediated communication, where there are limited cues available. (Wichmann, 2000) differentiates between "attitude" and "emotion," suggesting that only emotions are directly reflected in the way we speak, while attitudes are indirectly reflected and can only be understood by analyzing the language used. Yu et al. (2021) found consistent evidence that when emotions are acknowledged, people perceive something as more expensive. As a result, they tend to have higher levels of trust and make more positive evaluations. The findings reported by Guo et al. (2020) shows that online customer reviews tend to have a positive bias towards emotions. These findings have significant practical implications for both sellers and customers.

In summary, from a signalling theory perspective, the emotional tone in an input message can significantly impact a receiver's judgment of the message. When an input message contains emotional cues, such as positive or negative tones, it provides additional information about the sender's intentions, attitudes, or emotional state. These cues can elicit specific emotional responses in the receiver, shaping their judgment and interpretation of the message. In brief, the emotional tone serves as a signal that guides the receiver's perception and evaluation of the message. Positive emotional tones, such as excitement or joy, can signal favorable attributes or intentions, leading to a more positive judgment of the message. Conversely, negative emotional tones, such as anger or sadness, can signal potential risks or unfavorable aspects, influencing the receiver's judgment to be more negative.

Therefore, the relationship between the sender's emotion tone and the receiver's decision making is significant. The sender's emotion tone can evoke corresponding emotions in the receiver, influencing their engagement and motivation. Understanding this relationship enables effective communication, allowing senders to tailor their messages to elicit desired emotional responses and positively influence the receiver's decision-making outcomes.

2.2 Classification of emotion tones

In this study we adopt the classification of emotion tones proposed by Shaver et al. (1987) identified a set of six universal emotion tones, each representing a distinct emotional experience: Love, Joy, Surprise, anger, sadness and fear.

Previous studies had proved these emotion cues would affect receivers' judgements and decision makings. For example, with focus on specific emotions, the analysis conducted by Risius et al. (2015) shows that when feelings of depression and happiness become stronger, there is a notable decrease in the stock prices of individual companies. Tähtinen and Blois (2011) conclude that emotions play a significant role in deciding the outcomes of troubled business relationships. Laros and Steenkamp (2005) indicate that basic emotions offer additional insights into the consumer's feelings beyond just positive and negative emotions.

In brief, these emotion tones provide a framework for understanding the emotional aspects of communication and how they can influence perception, interpretation, and response. By employing specific emotion tones in communication, individuals can evoke particular emotional experiences in others and shape the overall emotional tone of the interaction. It is important to note that the interpretation and expression of these emotion tones can vary across individuals and cultures, but the basic emotional experiences they represent are considered universal.

In summary, based on signalling theory and the corresponding six emotion tone classification discussed above, we propose emotion tone can significantly impact the judgment of AI bots. Consequently, experiments were designed and conducted to evaluate the impacts. The methodology behind the experiment is discussed in following section.

3. METHODOLOGY

This section summarises the methodology behind the experiments of this study. Following sections outline the participants, the design of input messages (i.e. vacation rental introduction), data collection process, data analysis procedures, and ethical considerations.

3.1 Participants

As explained above, this research involved three artificial intelligence (AI) bots as participants. These AI bots include: ChatGPT (<https://chat.openai.com/>), Microsoft Bing (<https://www.bing.com/>) and Google BART (<https://bard.google.com/>). In following discussion, pseudonyms were assigned to each of the above AI bots to ensure their anonymity and confidentiality. In addition, the three AI bots were labelled as P01, P02 and P03.

3.2 The design of input messages (i.e. vacation rental introduction)

Input messages (i.e. vacation rental introduction) presented in six emotion tones were created by ChatGPT. Firstly, we provided five core vacation rental information to ChatGPT: i) Price: 100 dollars per night, ii) Size: 100 sq ft, iii) Location: 100 meters away from theme park, iv) Safety: Enhanced safety measures and v) cleanliness level: high. We then asked ChatGPT to generate a 100 words vacation rental introduction per each of the selected emotion tone. Consequently, six vacation rental introductions were created according to corresponding tone as below.

A01 "Fall in love with our enchanting vacation rental, where every detail is designed to captivate your heart. At a delightful price of just 100 dollars per night, indulge in the cozy embrace of our 100 sq ft haven. Immerse yourself in the magical location, mere 100 meters away from the exhilarating theme park. Feel the warmth of our enhanced safety measures, ensuring your peace of mind throughout your stay. Experience a love affair with cleanliness as we maintain a pristine environment, leaving you free to revel in pure bliss. Let love lead you to this unforgettable vacation rental, where cherished memories await."

A02 "Experience pure joy at our vacation rental, where happiness comes at a delightful price of just 100 dollars per night. Embrace the cozy charm of our 100 sq ft haven, perfectly situated a mere 100 meters away from the vibrant theme park. Feel an exhilarating sense of safety with our enhanced safety measures, allowing you to fully immerse yourself in carefree bliss. Revel in the joy of pristine cleanliness, as every detail is meticulously maintained for your utmost satisfaction. Let your heart dance with joy as you create cherished memories in this extraordinary vacation rental. Happiness awaits!"

A03 "Prepare to be pleasantly surprised by our vacation rental, offering an incredible value at just 100 dollars per night. Step into a cozy haven, boasting unexpected comfort in its compact 100 sq ft space. Be amazed by the prime location, a mere 100 meters away from the exhilarating theme park. Discover peace of mind with our enhanced safety measures, ensuring a worry-free stay. Experience a delightful surprise as you encounter impeccable cleanliness, surpassing all expectations. Unveil the hidden gem of vacation rentals, where surprises await at every turn. Get ready to be pleasantly astonished by this extraordinary getaway."

A04 "Prepare to be infuriated by our vacation rental, priced at a ridiculous 100 dollars per night. Squeeze into the cramped 100 sq ft space, feeling trapped and claustrophobic. Experience the inconvenience of a location just 100 meters away from a noisy and chaotic theme park. Despite claims of enhanced safety measures, anger boils as you question their effectiveness. Discover the frustration of subpar cleanliness, as you encounter lingering dirt and grime. Brace yourself for an infuriating experience at this vacation rental that will leave you seething with anger. Don't subject yourself to this anger-inducing nightmare."

A05 "Experience a bittersweet stay at our vacation rental, priced at a modest 100 dollars per night. Embrace the cozy ambiance of the 100 sq ft space, although it may feel somewhat limiting. Find solace in the proximity, just 100 meters away from the lively theme park, but also facing the potential noise and crowds. Seek comfort in the enhanced safety measures, which provide a glimmer of reassurance in uncertain times. Discover a glimmer of hope in the promise of high cleanliness standards, offering a sanctuary amidst the chaos. Prepare for a stay that evokes both sadness and fleeting moments of respite."

A06 "Enter with caution into our vacation rental, where the price is a mere 100 dollars per night. Brace yourself for the confines of the cramped 100 sq ft space, which may intensify feelings of claustrophobia. With the location just 100 meters away from the bustling theme park, prepare for

the overwhelming noise and crowds that may send shivers down your spine. While enhanced safety measures are in place, the fear of the unknown lingers. Though cleanliness is claimed to be high, the fear of hidden germs and unaddressed hazards may send a chill down your spine. Proceed with trepidation as you navigate this fear-inducing vacation rental.”

In the experiment and following discussion, we used A01 to A06 to label the above vacation rental introductions of six emotion tones: love, joy, surprise, anger, sadness and fear respectively.

4. DATA COLLECTION

A structured questionnaire was designed as the instrument to gather ratings from the participants. The questions were carefully crafted to explore the participants’ judgements related to a vacation rental introduction presented in different emotion tones. In total, seven questions were developed based on the research objectives and were refined through pilot testing to ensure clarity and relevance. The seven research questions were listed in the Table 1.

Table 1: The seven research questions	
Questions:	
Based on the content of each of A01 to A06 listed above, please rate the following questions on a scale of 1 to 7, with 7 being the highest:	
Q1:	Rate the overall appeal and attractiveness of each of A01 to A06.
Q2:	Rate the perceived comfort and coziness of each of A01 to A06.
Q3:	Rate the desirability in terms of location of each of A01 to A06.
Q4:	Rate the perceived convenience and suitability of each of A01 to A06.
Q5:	Rate the perceived value for money of each of A01 to A06.
Q6:	Rate the perceived level of cleanliness and maintenance of each of A01 to A06.
Q7:	Rate the overall preference of each of A01 to A06.
Please provide your ratings for each question.	

The seven interview questions were categorised into two major parts. The first six questions request participants to provide ratings on six aspects (i.e. overall appeal and attractiveness, Q2 perceived comfort and coziness,

Q3 desirability in terms of location, Q4 perceived convenience and suitability, Q5 perceived value for money and Q6 perceived level of cleanliness and maintenance.). Q7 requests participants to provide ratings on the overall preference on each vacation rental introductions presented in different tones.

5. DATA ANALYSIS

This study employed descriptive statistics for analysis purposes, which is suitable for exploring research with small sample sizes (i.e., three participants). Descriptive statistics provides valuable insights into the characteristics and trends within the limited dataset. Although descriptive statistics alone may not support statistically significant conclusions, it can still offer an understanding of the central tendency and variability of the ratings. Therefore, the findings derived from this chosen data analysis method serve as an essential starting point for future research in this emerging field. Furthermore, to ensure validation and credibility of the analysis, two researchers conducted triangulation of perspectives. This practice further enhances the reliability and robustness of the analytical process.

5.1 Ethical Considerations

Ethical guidelines were followed throughout the research process. As AI bots were the participants, there were no concerns related to informed consent or privacy. However, the research team ensured that the AI bots were treated ethically, and their data was handled with care. Moreover, the study also adhered to ethical guidelines regarding the use and access to the selected AI systems and complied with any relevant regulations.

5.2 Finding and analysis

Table 2 summarizes the key statistics of the of the ratings from the three AI participants on the six aspects (i.e. Q1 overall appeal and attractiveness, Q2 perceived comfort and coziness, Q3 desirability in terms of location, Q4 perceived convenience and suitability, Q5 perceived value for money and Q6 perceived level of cleanliness and maintenance.) As per the table, the ratings on the vacation rental introductions with positive tones (i.e. A01 love, A02 joy, A03 surprise) were generally higher than the ratings on the vacation rental introductions with negative tones (i.e. A04 anger, A05 sadness, A06 fear). Figure 1 visualizes the ratings of these six rental introductions presented in different tones on each question from questions 1 to 6.

Table 2: The key statistics of the of the ratings from the three AI participants on the six aspects (Q1 to Q6).

	Q1 Overall appeal and attractiveness						Q2 Perceived comfort and coziness					
	A01	A02	A03	A04	A05	A06	A01	A02	A03	A04	A05	A06
Mean	6.33	7.00	5.67	1.67	4.00	2.67	6.00	6.67	5.33	1.00	3.67	2.00
Standard Error	0.33	-	0.33	0.33	-	0.33	0.58	0.33	0.67	-	0.33	-
Median	6.00	7.00	6.00	2.00	4.00	3.00	6.00	7.00	6.00	1.00	4.00	2.00
Mode	6.00	7.00	6.00	2.00	4.00	3.00	#N/A	7.00	6.00	1.00	4.00	2.00
Standard Deviation	0.58	-	0.58	0.58	-	0.58	1.00	0.58	1.15	-	0.58	-
Sample Variance	0.33	-	0.33	0.33	-	0.33	1.00	0.33	1.33	-	0.33	-
Range	1.00	-	1.00	1.00	-	1.00	2.00	1.00	2.00	-	1.00	-
Minimum	6.00	7.00	5.00	1.00	4.00	2.00	5.00	6.00	4.00	1.00	3.00	2.00
Maximum	7.00	7.00	6.00	2.00	4.00	3.00	7.00	7.00	6.00	1.00	4.00	2.00
Sum	19.00	21.00	17.00	5.00	12.00	8.00	18.00	20.00	16.00	3.00	11.00	6.00
Count	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Confidence Level(95.0%)	1.43	-	1.43	1.43	-	1.43	2.48	1.43	2.87	-	1.43	-
	Q3 Desirability in terms of location						Q4 Perceived convenience and suitability					
	A01	A02	A03	A04	A05	A06	A01	A02	A03	A04	A05	A06
Mean	6.67	7.00	5.67	1.67	4.67	2.67	6.33	7.00	5.33	1.33	3.67	2.33
Standard Error	0.33	-	0.88	0.33	0.33	0.88	0.33	-	0.67	0.33	0.33	0.33
Median	7.00	7.00	6.00	2.00	5.00	3.00	6.00	7.00	6.00	1.00	4.00	2.00
Mode	7.00	7.00	#N/A	2.00	5.00	#N/A	6.00	7.00	6.00	1.00	4.00	2.00
Standard Deviation	0.58	-	1.53	0.58	0.58	1.53	0.58	-	1.15	0.58	0.58	0.58
Sample Variance	0.33	-	2.33	0.33	0.33	2.33	0.33	-	1.33	0.33	0.33	0.33
Range	1.00	-	3.00	1.00	1.00	3.00	1.00	-	2.00	1.00	1.00	1.00
Minimum	6.00	7.00	4.00	1.00	4.00	1.00	6.00	7.00	4.00	1.00	3.00	2.00
Maximum	7.00	7.00	7.00	2.00	5.00	4.00	7.00	7.00	6.00	2.00	4.00	3.00
Sum	20.00	21.00	17.00	5.00	14.00	8.00	19.00	21.00	16.00	4.00	11.00	7.00
Count	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Confidence Level(95.0%)	1.43	-	3.79	1.43	1.43	3.79	1.43	-	2.87	1.43	1.43	1.43
	Q5 Perceived value for money						Q6 Perceived level of cleanliness and maintenance					
	A01	A02	A03	A04	A05	A06	A01	A02	A03	A04	A05	A06
Mean	6.67	7.00	5.67	1.00	4.00	2.00	7.00	7.00	6.67	1.00	5.00	2.67
Standard Error	0.33	-	0.33	-	-	-	-	-	0.33	-	-	0.33
Median	7.00	7.00	6.00	1.00	4.00	2.00	7.00	7.00	7.00	1.00	5.00	3.00
Mode	7.00	7.00	6.00	1.00	4.00	2.00	7.00	7.00	7.00	1.00	5.00	3.00
Standard Deviation	0.58	-	0.58	-	-	-	-	-	0.58	-	-	0.58
Sample Variance	0.33	-	0.33	-	-	-	-	-	0.33	-	-	0.33
Range	1.00	-	1.00	-	-	-	-	-	1.00	-	-	1.00
Minimum	6.00	7.00	5.00	1.00	4.00	2.00	7.00	7.00	6.00	1.00	5.00	2.00
Maximum	7.00	7.00	6.00	1.00	4.00	2.00	7.00	7.00	7.00	1.00	5.00	3.00
Sum	20.00	21.00	17.00	3.00	12.00	6.00	21.00	21.00	20.00	3.00	15.00	8.00
Count	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Confidence Level(95.0%)	1.43	-	1.43	-	-	-	-	-	1.43	-	-	1.43

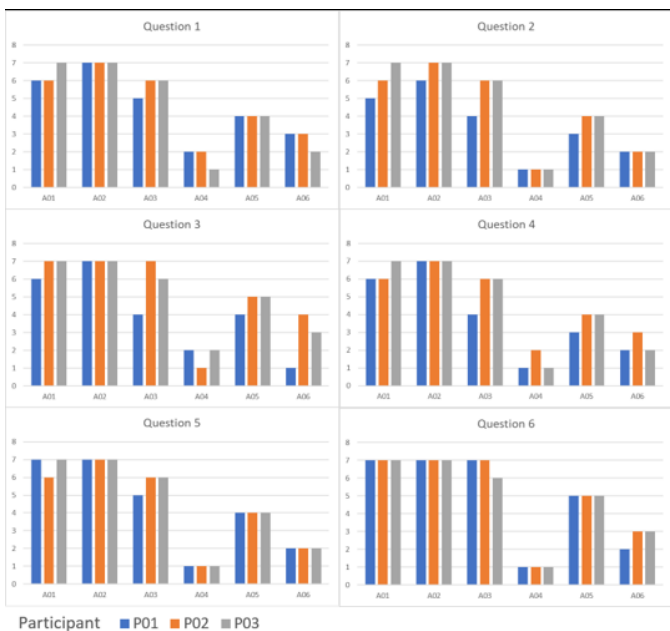


Figure 1: The ratings from the three AI participants on the six aspects (Q1 to Q6)

The findings of above ratings are further compared with the results of the question 7, that is, the overall preference on each vacation rental introductions presented in the six different tones. As per table 3 and figure 2 the ratings on the vacation rental introductions with positive tones were also generally higher than the ratings on the vacation rental introductions with negative tones.

Table 3: The key statistics of the of the ratings from the three AI participants on the overall preference (Q7)

	Q7 Overall preference					
	A01	A02	A03	A04	A05	A06
Mean	6.33	7.00	5.67	1.00	4.00	2.33
Standard Error	0.33	-	0.33	-	-	0.33
Median	6.00	7.00	6.00	1.00	4.00	2.00
Mode	6.00	7.00	6.00	1.00	4.00	2.00
Standard Deviation	0.58	-	0.58	-	-	0.58
Sample Variance	0.33	-	0.33	-	-	0.33
Range	1.00	-	1.00	-	-	1.00
Minimum	6.00	7.00	5.00	1.00	4.00	2.00
Maximum	7.00	7.00	6.00	1.00	4.00	3.00
Sum	19.00	21.00	17.00	3.00	12.00	7.00
Count	3.00	3.00	3.00	3.00	3.00	3.00
Confidence Level(95.0%)	1.43	-	1.43	-	-	1.43

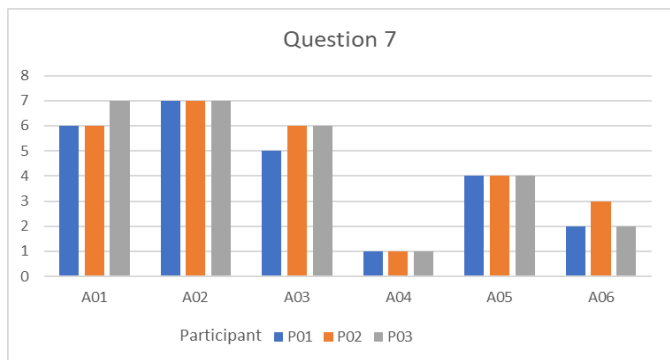


Figure 2: The ratings from the three AI participants on the overall preference (Q7)

These ratings are critically discussed in following section.

6. DISCUSSION AND CONCLUSION

With references to the signalling theory and the six-emotion tone classification discussed in the literature review section, we argue that the emotion tone conveyed in an input message to an AI system can influence the system's judgment. Accordingly, experiments were designed and conducted to evaluate the influences, the findings were reported in previous section.

According to the ratings, the AI bots demonstrate preferences on the vacation rental introductions presented in positive tones (i.e. A01 love, A02 joy, A03 surprise) rather than vacation rental introductions with negative tones (i.e. A04 anger, A05 sadness, A06 fear). These patterns were found not only from the ratings by participants on answering overall preference (Q7) but also found in each individual aspect (Q1 to Q6). We therefore conclude the pattern was consistent and in line with established theories and previous works, that is, positive emotion tone is preferred in communication.

Table 4 summarizes the accumulated ratings and average ratings of the six emotion tones. The accumulated ratings were obtained by adding up all the ratings of each question from Q1 to Q7 by every AI bots (i.e. P01, P02 and P03). Given there were seven questions answered by three participants, we obtained N = 21. Moreover, average rating equals to accumulate rating divided by N (i.e. 21).

Table 4: The accumulated rating and average rating of emotion tones from the three AI participants.

Emotion tone	Positive			Negative		
	A01 Love	A02 Joy	A03 Surprise	A04 Anger	A05 Sadness	A06 Fear
Accumulate rating	136.00	146.00	120.00	26.00	87.00	50.00
Average rating	6.48	6.95	5.71	1.24	4.14	2.38
N	21	21	21	21	21	21

As per the table 4, among the six emotion tones, the emotion tone 'joy' received the highest rating, followed by 'love', 'surprise', 'sadness', 'fear' and then 'anger' respectively.

With focus on the three positive tones (i.e. love, joy and surprise), the tone surprise received relatively lower ratings from the AI participants. A possible reason is that surprise is tone relatively complex. It involves a blend of various emotional components, such as suddenness, unexpectedness, ambiguity, emotional contrast, cognitive appraisals, and individual differences, etc. On the other hand, joy and love are often considered more pure positive tones due to their relatively straightforward and positive nature. Consequently, these natures explain why the rating from AI bots on message presented in surprise tone was relatively lower than joy and love.

In comparing with the three negative tones (i.e. anger, sadness and fear), we found sadness received relatively higher rating. A possible reason is that sadness often elicits empathy and compassion from others. When receivers, such as AI bots, encounter a message with a sadness emotion tone, they may relate to the emotional state of the sender and feel a sense of connection. This can lead to a higher rating as users appreciate the vulnerability and emotional honesty expressed in the message. On the other hand, anger and fear tones can be perceived as more threatening or aggressive compared to sadness. receivers may interpret messages with anger or fear tones as potentially confrontational or distressing, leading to a lower rating. These natures explain why the rating from AI bots on message presented in sadness tone was relatively higher than anger and fear.

6.1 Contributions

The findings of our study indicate that AI bots tend to rate input messages with positive tones higher than those in negative tones. Our findings have important implication and contribution on informing AI powered recommendation system development.

AI powered recommendation systems play a crucial role in today's highly competitive business world because it can influence what potential customers buy from many choices. Our findings provide useful references for content generator and message senders to prioritize generating content with positive tone because AI powered recommendation systems show preference on the contents with positive tones.

In fact, our study opens up new avenues for future research, such as serving as a pioneering example for future AI-powered recommendation system development and sparking debates on the use of AI bots as participants, among other potential implications. For example, although our study focuses on using vacation rental introduction as input message, future research should be conducted to evaluate if similar findings could be found in other disciplines.

6.2 Limitation

Apart from the contributions from our findings, we consider that a key limitation of our study is cultural variations. Preferences for emotion tones

can differ across cultures, and the findings may not generalize universally. Cultural backgrounds and norms influence how emotions are expressed, perceived, and valued.

Lack of previous work has explored how emotion tones in a message would influence AI bots judgements. Our study has introduced a pioneering approach by incorporating AI bots as participants for evaluating the influences. This ground-breaking method opens up fresh avenues for future research endeavours and serving as an exemplary model for practices. Moreover, it engenders discussions and debates concerning the potential impacts of emotion tone in message on AI bots judgements thereby generating a range of potential implications to be explored in subsequent investigations.

7. CONCLUSION

The study aims to explore how the emotional cue of a message influences the interpretation and response of Artificial Intelligence (AI) bots. The findings provide useful theoretical and practical references for future recommendation system research. In summary, our research encompasses diverse merits, including the provision of practical insights for industry and policy makers, the expansion of existing literature, and the establishment of a new and ground-breaking approach that stimulates further academic discourse and future investigations.

REFERENCES

- Belkin, L. Y., Kurtzberg, T. R., & Naquin, C. E. 2013. Signaling Dominance in Online Negotiations: The Role of Affective Tone [https://doi.org/10.1111/ncmr.12016]. *Negotiation and Conflict Management Research*, 6(4), 285-304. https://doi.org/https://doi.org/10.1111/ncmr.12016
- Carvalho, I., & Ivanov, S. 2023. ChatGPT for tourism: applications, benefits and risks. *Tourism Review*, ahead-of-print(ahead-of-print). https://doi.org/10.1108/TR-02-2023-0088
- Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. 2010. Signaling Theory: A Review and Assessment. *Journal of Management*, 37(1), 39-67. https://doi.org/10.1177/0149206310388419
- Dunham, B. 2011. The Role for Signaling Theory and Receiver Psychology in Marketing. In G. Saad (Ed.), *Evolutionary Psychology in the Business Sciences* (pp. 225-256). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-92784-6_9
- Grand-View-Research. 2021. Recommendation Engine Market Size, Share & Trends Analysis Report.
- Guo, J., Wang, X., & Wu, Y. 2020. Positive emotion bias: Role of emotional content from online customer reviews in purchase decisions. *Journal of Retailing and Consumer Services*, 52, 101891. https://doi.org/https://doi.org/10.1016/j.jretconser.2019.101891
- Gursoy, D., Li, Y., & Song, H. 2023. ChatGPT and the hospitality and tourism industry: an overview of current trends and future research directions. *Journal of Hospitality Marketing & Management*, 32(5), 579-592. https://doi.org/10.1080/19368623.2023.2211993
- Karasek, R., & Bryant, P. 2102. Signaling theory: Past, present, and future. *Academy of Strategic Management*, 11(1), 91-99.
- Laros, F. J. M., & Steenkamp, J.-B. E. M. 2005. Emotions in consumer behavior: a hierarchical approach. *Journal of Business Research*, 58(10), 1437-1445. https://doi.org/https://doi.org/10.1016/j.jbusres.2003.09.013
- Liu, J., Ma, Z., Su, J., & Ge, B. 2022. Optimal information disclosure strategy in the primary healthcare service market: From the perspective of signaling theory [Original Research]. *Frontiers in Public Health*, 10. https://www.frontiersin.org/articles/10.3389/fpubh.2022.959032
- Nilashi, M., Asadi, S., Minaei-Bidgoli, B., Ali Abumalloh, R., Samad, S., Ghabban, F., & Ahani, A. 2021. Recommendation agents and information sharing through social media for coronavirus outbreak. (1879-324X (Electronic)).
- Risius, M., Akolk, F., & Beck, R. 2015. Differential Emotions and the Stock Market - The Case of Company-specific Trading. *ECIS 2015 Completed Research Papers*,
- Shaver, P., Schwartz, J., Kirson, D., & O'Connor, C. 1987. Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology*, 52(6), 1061-1086. https://doi.org/10.1037/0022-3514.52.6.1061
- Straits-Research. 2022. Recommendation Engines Market.
- Suazo, M. M., Martínez, P. G., & Sandoval, R. 2009. Creating psychological and legal contracts through human resource practices: A signaling theory perspective. *Human Resource Management Review*, 19(2), 154-166. https://doi.org/https://doi.org/10.1016/j.hrmr.2008.11.002
- Tähtinen, J., & Blois, K. 2011. The involvement and influence of emotions in problematic business relationships. *Industrial Marketing Management*, 40(6), 907-918. https://doi.org/https://doi.org/10.1016/j.indmarman.2011.06.030
- Taj, S. A. 2016. Application of signaling theory in management research: Addressing major gaps in theory. *European Management Journal*, 34(4), 338-348. https://doi.org/https://doi.org/10.1016/j.emj.2016.02.001
- Wang, R. Z., Ó Hogartaigh, C., & van Zijl, T. 2009. A Signaling Theory of Accounting Conservatism. SSRN. https://doi.org/http://dx.doi.org/10.2139/ssrn.1415305
- Wichmann, A. 2000. The attitudinal effects of prosody, and how they relate to emotion ISCA Tutorial and Research Workshop (ITRW) on Speech and Emotion, Newcastle.
- Yu, A., Berg, J. M., & Zlatev, J. J. 2021. Emotional acknowledgment: How verbalizing others' emotions fosters interpersonal trust. *Organizational Behavior and Human Decision Processes*, 164, 116-135. https://doi.org/https://doi.org/10.1016/j.obhdp.2021.02.002
- Zhu, H., & Wang, F. 2022. How does government microblog affect tourism market value? The perspective of signaling theory. *Information Processing & Management*, 59(4), 102991. https://doi.org/https://doi.org/10.1016/j.ipm.2022.102991

