FEELING IN SYNC: EXPLORING EMOTIONAL CONTAGION BETWEEN LIVE STREAMERS AND VIEWERS IN TOURISM LIVE STREAMING

Abstract

Digital emotional contagion shapes how emotions spread and align among participants in the online community. This phenomenon is especially evident in the real-time interactions of tourism live streaming. However, little is known about how emotional contagion unfolds during these real-time interactions. Given that, this study seeks to examine the generative mechanisms of emotional contagion in tourism live streaming. Study One used dynamic time warping and panel vector autoregression to analyze the contagion process across 105 tourism live streaming sessions. Study Two applied BERTopic modeling to identify emotionally contagious topics engaging streamers and viewers. The findings deepen the theoretical understanding of digital emotional contagion by highlighting its interactivity, multi-directionality, and synchronicity. It also reveals the complex interplay between positive and negative emotional contagion and contagious topics. These insights help digital marketers understand the direction and characteristics of emotional contagions, and effectively foster viewers' emotional engagement for community building and loyalty.

Keywords: digital emotional contagion, real-time interaction, tourism live streaming, online community, viewer engagement

INTRODUCTION

Tourism live streaming involves real-time interactions that reshape how online participants co-engage in online communities (Deng, Benckendorff, & Wang, 2022). Unlike asynchronous formats (e.g., blogs or review sites), tourism live streaming enables viewers and streamers to interact instantly. In tourism live streaming, emotions and responses circulate without delay. This immediacy has attracted wide attention across the global tourism industry. Tourism Australia introduced "Australia Live" to stream travel experiences directly to online viewers (Tourism Australia, 2020). The Singapore Tourism Board also launched a live streaming initiative in 2021 to connect international viewers with residents in real-time (Bapna, 2021). In China, tourism live streaming reached new levels of viewer engagement. The "Virtual Travel in China" event on WeChat attracted over 12 million active viewers (Ceci, 2022). During the 2023 Spring Festival, Ctrip's Thailand live streaming drew more than 10 million participants. As witnessed by the industry, this synchronous communication creates new possibilities for emotional connection, community building, and destination storytelling (Hua, Li, & Zhang, 2023).

In fact, synchronous emotional exchange in tourism live streaming is a key driver of high viewer engagement (Ye et al., 2022). Research has shown that mutual emotional exchanges lead to unconscious emotional synchronization, especially during real-time interactions (Cheshin et al., 2011). This phenomenon, known as digital emotional contagion (Goldenberg & Gross, 2020), describes the process by which emotions are transmitted and amplified in digital environments. While most contagion studies emphasize face-to-face settings (Barsade et al., 2018; Hess & Blairy, 2001), tourism live streaming extends such similar emotional synchrony to digital platforms. Viewers engage not only by expressing their own emotions

but by immediately responding to streamers and other viewers, creating a reciprocal loop of emotional reinforcement (Herrando & Constantinides, 2021). Such immediacy distinguishes live streaming from asynchronous formats, where delayed interactions interrupt emotional continuity and weaken contagion effects (Deng et al., 2019, 2021; Lu & Hong, 2022). Real-time emotional contagions thus become central to sustaining community bonding and engagement in tourism live streaming (Song et al., 2024).

Despite its importance, research on digital emotional contagion remains limited. Most studies primarily examine post-communication outcomes (e.g., travel intentions and purchase behaviors), little is known about the digital emotional contagion process during real-time interactions (Xie et al., 2022). Meanwhile, the understanding of digital emotional contagion predominantly comes from asynchronous social media platforms, such as Facebook (Martínez García de Leaniz et al., 2025) and online reviews (Chou, 2023). In these asynchronous contexts, content creators express emotions at one point, while audiences respond later (Ruiz-Mafe et al., 2020). This fragmented emotional exchange limits the understanding of the real-time contagion process. Emotional contagion is often treated as a static status (Kramer et al., 2014). However, emotions can spread continuously and expand through synchronous interactions on social media (Elfenbein, 2014; Goldenberg & Willer, 2023). Neglecting the continuity and dynamics of digital emotional contagion limits a comprehensive understanding of the phenomenon. Further research is needed to examine this dynamic process.

Additionally, tourism research has traditionally emphasized the benefits of positive emotional exchanges among online participants (e.g., Zhang et al., 2023) and diminished the role of negative emotions (e.g., Kujur & Singh, 2018). However, some psychological studies offer a contrasting perspective, suggesting that negative emotions also enhance contagions and engagement during media content consumption (Berger & Milkman, 2012). This perspective

is particularly relevant in tourism social media, where destination cultures and experience discussions may raise positive or negative emotions (Deng et al., 2022; Chi et al., 2025). Meanwhile, positive and negative emotions are not isolated during real-time interactions. They become convertible (Ferrara & Yang, 2015). Nevertheless, tourism literature has frequently regarded emotions as static and isolated, thereby overlooking the interconnections of positive and negative emotional contagion. Thus, recognizing the interplay between positive and negative emotional contagions is needed, especially for enhancing viewer engagement and community building (Teixeira, Wedel, & Pieters, 2012).

Thirdly, research on emotional contagion has primarily focused on one-way emotional transmission, typically from content providers to viewers (Kramer et al., 2014; Qi & Li, 2024). However, the emotional inputs of viewers during emotional contagions remain underexplored (Cheng, Wei, & Zhang, 2020). In tourism live streaming, viewers actively expressed their emotions to streamers and other co-viewers (Chi et al., 2025). The common assumption that viewers are passive recipients fails to recognize their emotional involvement in shaping emotional contagion. This oversimplifies the viewers' role in digital emotional contagion, particularly in the context of synchronous social media. This one-sided approach overlooks the mutual nature and co-construction of emotional contagion (Liu, Wang, & Zhang, 2024). To enhance digital emotional contagions, it is essential to explore the roles of both streamers and viewers (Goldenberg & Willer, 2023).

The methodological approach to studying real-time emotional contagion remains underdeveloped. Existing research predominantly relies on self-reported techniques (e.g., online surveys and interviews) to explore emotional contagion in asynchronous media contexts (Meyer et al., 2023; Yi et al., 2025). These methods are limited in their ability to objectively track the dynamics of emotional contagion over time, as they do not enable real-time monitoring of naturally occurring data (Herrando & Constantinides, 2021). More

innovative methods, such as advanced big data techniques, are essential for capturing and analyzing emotional contagion in real-time.

Against this backdrop, this study aimed to answer a research question: How do digital emotional contagions develop in tourism live streaming? The research objectives are twofold: (1) to explore the positive and negative emotional contagion process observed in real-time interactions, and (2) to identify emotionally contagious topics engaged among streamers and viewers. By combining global dynamic time warping and the panel vector autoregression model, the research examines the emotional contagion process between streamers and viewers. Emotional topics are identified through localized dynamic time warping, BERTopic modeling, and word cloud visualization. This research contributes to the literature on digital emotional contagion by demonstrating the real-time, multi-directional, and fluid nature of digital emotional contagion (Goldenberg et al., 2020). It further distinguishes between the contagions of positive and negative emotions, revealing their unique contagion patterns across different destination contexts. These insights help digital marketers and influencers understand the direction and characteristics of both positive and negative emotional contagions. The tourism professionals can effectively capture viewers' emotional attention using emotionally contagious topics, increasing engagement and community loyalty (Thomas & McGarty, 2009).

LITERATURE REVIEW

The literature review contains four sections: (1) tourism live streaming, (2) emotional contagion, (3) emotional contagion on social media, and (4) emotional contagion in tourism live streaming. The first section introduced tourism live streaming and existing research on its emotional interactions. The second section reviewed emotional contagion and its theoretical foundations, explaining the current knowledge of transmission features. The third section outlined digital emotional contagion in social media, identifying key studies and gaps. The fourth section synthesizes the uniqueness of digital emotional contagion in tourism live streaming.

Tourism Live Streaming

Tourism live streaming has emerged as a prominent social media that integrates real-time destination presentation with immediate interaction (Deng et al., 2019). It allows streamers and viewers to engage simultaneously, fostering continuous and direct exchanges. Emotional expressions are shared, perceived, and consumed instantly (Lv et al., 2022). Given that, the synchronous interactions in tourism live streaming enables large-scale and transparent emotional exchanges among onine participants (Luo et al., 2020). Participants shared emotional experiences, forming collective emotional connections (Chi et al., 2025; Hua et al., 2023). In contrast, asynchronous digital platforms (e.g., YouTube and Facebook) often involve delayed responses. Content is consumed after it is produced, and users interact over extended periods (Deng et al., 2022). Such asynchronous interaction involves time gaps between message creation and response. Participants do not co-exist online (Chi et al., 2025). Current tourism studies primarily investigate tourism live streaming by streamers and viewers (Zheng, Wu, & Liao, 2024). Streamers are widely recognized as emotional transmitters in tourism live streaming. Through expressions and content, they convey emotions that shape

viewers' emotional states (Shuqair et al., 2024). Viewers absorb these emotions, influencing their behaviors, such as purchase decisions and visit intentions (Xie et al., 2022). In this case, many studies explored the sharing motivations of streamers in the pre-streaming stage (e.g., Liu et al., 2022; Li, Ma, & Tong, 2024). In the post-streaming stage, tourism scholars adopted a marketing-centric approach to examine the commercial benefits that this social media creates for streamers, such as virtual gifts and tips (e.g., Fu et al., 2024) and effective product sales (Li et al., 2021). In contrast, only a few studies discussed streamer-viewer emotional exchanges from a real-time perspective, where the para-social relationship between streamers and viewers was attributed to positive and negative (Deng et al., 2022).

On the other hand, viewers were acknowledged as passive recipients of streamers' emotions (Hua et al., 2023). Tourism research has primarily examined viewers' post-streaming behaviors, including trust in promoted products (Qiu et al., 2021), purchase decisions (Qiu et al., 2021; Xie et al., 2021; Xu et al., 2022), and shifts in destination preferences (Deng et al., 2023; Liu et al., 2022; Qiu et al., 2021). While scholars have theorized that the synchronicity of tourism live streaming enables viewers to express and share emotions in real-time, few empirical studies have examined how emotional engagement unfolds dynamically during live interactions.

In sum, existing literature primarily focuses on streamers' influence on viewers' behavior in the decision-making phase. However, the dynamic emotional exchanges between streamers, viewers, and fellow viewers remain underexplored. While recent studies recognize the emotional interaction opportunities in tourism live streaming (Deng et al., 2022; Lin, Yao, & Chen, 2021), the mechanisms behind these real-time emotional exchanges are not fully understood. This study aims to fill this gap by examining how viewers emotionally engage with both streamers and fellow viewers.

Emotional Contagions

Emotional contagion refers to the transmission of emotions between individuals during social interactions, leading to emotional synchronization (Crockett, 2017). It does not involve a precise replication of emotions but rather a dynamic process of adaptation and gradual alignment. Over time, one person's emotional expression influences the other's response, resulting in a convergence of emotional states (Hatfield et al., 1994; Herrando & Constantinides, 2021). Emotional contagion is a fundamental aspect of human behavior, as individuals naturally align their emotional states with those around them (Ekman et al., 1983; Hatfield et al., 1994).

In history, Le Bon (1895) first explored emotional contagion, emphasizing how emotions synchronize within crowds. He argued that emotional unity can arise among individuals with differing beliefs. Durkheim (1912) and Collins (2004) further linked emotional contagion to group dynamics and collective knowledge, establishing it as a central concept for understanding collective behavior (Goodwin et al., 2000). Current research on emotional contagion has primarily focused on static emotional theories, such as emotional arousal (Hernando et al., 2022; Prochazkova & Kret, 2017) and empathy (Decety & Ickles, 2009; De Waal, 2010; Panksepp, 2011). For example, Elfenbein (2014) demonstrated that emotional valence and arousal influence contagion. Empathy theory, on the other hand, suggests that emotional responses to others' feelings lead to empathic contagion (De Waal, 2010). While these theories have contributed to our understanding of emotional contagion, they have been critiqued for overlooking its real-time and bidirectional process (Hatfield, Rapson, & Le, 2011). Recent studies advocate for a shift to a process-oriented framework that better reflects the process of emotional contagion (Herrando & Constantinides, 2021).

Understanding the mechanism of emotional contagion is crucial for understanding its dynamics. Emotional contagion process has three key characteristics: (i) interactivity: it

occurs through interpersonal communication; (ii) directionality: it is a two-way process, involving a transmitter and a receiver; and (iii) similarity: the receiver shares similar emotional experiences and expressions with the transmitter (Herrando & Constantinides, 2021). The emotional synchrony are manifestations of emotional contagion (Hatfield et al., 1992). To better understand the dynamic processes of emotional contagions (Liu et al., 2022; Luo et al., 2022), some psychologists have proposed the imitation-feedback mechanism to explain the emotional contagion process. The mechanism consists of three stages: imitation, feedback, and infection (Zhang & Lu, 2013). Under the effect of emotional contagion, the imitation-feedback mechanism predicts how the emotions of the transmitter will affect others and how they will react (Von Scheve & Ismer, 2013). The mechanisms by which emotional infection occurs are as follows: emotional information is delivered → perceived by the receiver → unconscious imitation by the receiver →physiological feedback → emotional experience (Zhang, 2014). Regarding this, the imitation-feedback mechanism of emotional contagions explains how emotions are transmitted among people in social interactions and how "catching" another person's emotions affects the dynamics of real-time interaction (Li et al., 2017).

Emotional contagion has been examined through the imitation-feedback mechanism in face-to-face settings. Individuals observe others' emotions, mimic them, internalize the resulting feedback, and express aligned emotional responses (Zhang & Lu, 2013). Although traditionally studied in physical interactions, recent findings show its relevance in digital environments. Emotions can spread globally among financial investors, shaping decisions across markets (Yin & Wang, 2020). Similar patterns appear in online conversations, where emotional tones in posts and replies mirror each other (Liu et al., 2022). These insights support the argument that emotional contagion unfolds dynamically in social media communities, influencing real-time interactions beyond physical proximity.

Emotional Contagions on Social Media

With the increasing prevalence of social media, digital emotional contagion has garnered significant scholarly attention. Unlike social media storms, characterized by sudden, crisis-driven emotional outbursts (Rydén et al., 2022), digital emotional contagion involves a mix of positive and negative emotions, emerging through continuous social interactions.

In face-to-face interactions, emotional contagion occurs through direct cues, such as micro-expressions, voice tone, posture, and gestures. These nonverbal elements are key to offline emotional contagion (Woo & Chan, 2020; Zhang et al., 2023). In contrast, digital emotional contagion arises from online interactions, where text-based communication limits access to traditional nonverbal signals (Chi et al., 2025; Lee & Theokary, 2021; Kramer et al., 2014). Participants instead rely on digital cues like emojis, punctuation, and written messages to convey emotion. For example, users used linguistic and symbolic mimicry to engage in digital emotional contagions on Twitter and Facebook (Ferrara & Yang, 2015).

Current research on digital emotional contagion primarily focuses on pre-structured content from asynchronous social media platforms (e.g., Twitter and Facebook) and online reviews (Martínez García de Leaniz et al., 2025). These studies measured emotional valence and categorized emotions based on textual comments and posts. For instance, research on COVID-19 debated on Twitter highlights how negative emotional contagion spreads (Crocamo et al., 2021; Yin et al., 2022). In commercial contexts, multiple studies have examined the influence of digital emotional contagion with textual analysis, demonstrating that emotional alignment fosters viewer engagement and drives business success. Meng et al. (2021) found that emotional contagion through online comments significantly affects users' emotional experiences and engagement. Similarly, Meyer et al. (2023) observed that emotional contagion leads viewers to support influencers and actively engage with and share content. These studies emphasize that emotional contagion on social media plays a crucial

role in community building and commercial outcomes, including increased viewership and revenue (Lee & Theokary, 2021). To better understand how viewers respond to digital emotional contagion, recent studies also stress the focus on the roles of both creators and viewers in the emotional contagion process (Goldenberg & Willer, 2023).

Digital emotional contagion has also gained increasing attention in tourism and hospitality (see Table 1). Unlike face-to-face contagion studies focusing on service encounters and stakeholder–tourist interactions (e.g., Tsaur & Ku, 2019; Zhang et al., 2022), research on digital emotional contagion is primarily driven by crisis management and marketing purposes. For instance, Luo and Zhai (2017) demonstrated that the impacts of digital emotional contagions on social media often extend beyond the crisis event itself. These emotions fuel collective emotions and spark online discussions about tourism events and destinations (Zhai et al., 2019; Zheng et al., 2023). Particularly, tourism's inherently social, emotional, and hedonic attributes amplify this contagion on social media platforms (Schoner-Schatz et al., 2021; Wang et al., 2023). Recent studies also explore how emotional contagion drives content diffusion and influencer engagement (Bakri et al., 2024). Li et al. (2025) found that streamers' emotions significantly influence viewers' emotional states, underscoring the role of emotional contagion in real-time engagement. Despite these contributions, few studies examine emotional contagion as a dynamic process. Most focus on the downstream outcomes (e.g., shifts in behavioral intentions and business results). The real-time and bidirectional mechanisms of digital emotional contagion remain underexplored in tourism research (Li et al., 2025).

Insert Table 1. A Summary of Emotional Contagion Studies in Tourism and Hospitality.

Emotional Contagions in Tourism Live Streaming

Emotional interactions are central to tourism live streaming experiences and engagement (Deng et al., 2022; Hua et al., 2023). Recent studies suggest that emotional exchanges in

tourism live streaming include not only positive emotions but also negative ones (Li et al., 2025). These emotions do not flow solely from the streamer to the viewers. Emotional transmission also occurs among viewers. For example, Zhang and Xiao (2023) used facial recognition technology to track viewers' emotional responses during tourism live streaming. Their findings showed that positive emotions, such as happiness, intensified as viewers engaged with one another in emotional exchanges. Furthermore, emotions in tourism live streaming influence viewers' behavioral intentions, including travel plans and purchasing decisions (Zheng et al., 2023). For example, Alam et al. (2023) demonstrated that emotions like pleasure and arousal significantly impact online shopping behavior and impulsive buying.

Tourism live streaming allows real-time viewer comments and immediate streamer responses, but the emotional transmission processes in this context remain largely unexplored. Existing tourism research cannot fully address this gap. Previous studies have shown how emotional expressions in online reviews and travel blogs shape perceptions and attitudes (Tussyadiah, 2011; Wang et al., 2022). However, this content is static, pre-structured, and consumed passively, lacking real-time interaction between creators and readers. Some research has examined emotional expression through text and emojis in private instant messaging (Gretzel & Koo, 2021), but these exchanges are limited to dyadic interactions with minimal audience exposure. In contrast, tourism live streaming offers a dynamic environment for emotional contagion. Features such as collective visibility, temporal immediacy, and shared participation facilitate direct emotional exchanges between streamers and viewers. These interactions unfold in public, accessible to all participants simultaneously, enabling emotions to circulate and amplify within the digital space.

Given the unique dynamics of emotional transmission in tourism live streaming, emotional contagion in this context potentially follows a mimicry–feedback mechanism (Zhang & Lu,

2013). Online participants experience emotional contagions through three stages: mimicry, feedback, and contagion. The spread of emotional contagion occurs as follows: emotions shared via real-time conversations → perceived by online participants → unconscious imitation by online participants → real-time feedback → emotional experiences in tourism live streaming (as shown in Figure 1). Meanwhile, conversations shared by streamers and viewers inherently contain positive and negative emotions (Liu, Zhang, & Chen, 2022). As interactions unfold, online participants continuously absorb and mirror emotions in real-time. This process of emotional contagion triggers reciprocal emotional exchanges, cultivating a shared emotional experience. Such dynamics deepen participant engagement and foster a stronger sense of connection within the online community (Xu, Huang, & Shang, 2021).

Insert Figure 1. The Spread of Emotional Contagion in Tourism Live Streaming.

METHODOLOGY

A methodological framework (see Figure 2) was developed to analyze emotional contagion in tourism live streaming. The framework consists of three steps: (1) data collection and preprocessing, (2) exploring emotional contagion mechanisms, and (3) identifying emotionally contagious topics shared by streamers and viewers. In step 1, real-time comments from viewers and synchronous feedback from streamers were collected and pre-processed. Step 2 examined the emotional contagion process. Emotions of both streamers and viewers were measured using SnowNLP, followed by correlation tests (Pearson and Spearman) to assess emotional interrelationships. Global dynamic time warping was applied to map temporal alignments between the emotional scores of streamers and viewers. The Granger causality test, panel vector autoregression model, and impulse response function were used to analyze causality and dynamics in emotional contagion. Step 3 identified emotionally contagious topics. Local dynamic time warping pinpointed synchronized emotional contagion segments, and tourism live streaming sessions were categorized by destination context. The emotional contagion segments were mapped to these categories, and conversations from these segments were analyzed. BERTopic modeling was applied to identify topics discussed during emotional contagion, which were then visualized through Wordcloud and topic sorting.

Insert Figure 2. A Methodological Framework of the Study.

Data Collection and Pre-processing

This study used Douyin as the data source due to its dominant role in China's tourism live streaming market (Zhang et al., 2024). Data selection followed three criteria: (1) the streaming sessions were outdoor sightseeing rather than product sales; (2) the presence of streamers and viewers throughout the session; and (3) a minimum session length of 30

minutes. The 30-minute threshold reflects both theoretical and methodological considerations. Emotion transmission in live streaming evolves through sustained interaction (Herrando & Constantinides, 2021). Brief sessions lack this progression and limit observation of emotional contagion (Goldenberg & Gross, 2020). Empirical studies confirm that most live streaming exceeds this duration, as emotional engagement requires time to form (Chi et al., 2025; Deng et al., 2022). Analytically, dynamic time warping and SnowNLP rely on long-form sequences to detect emotional patterns with precision (Zhang et al., 2020). Shorter sessions compromise this process. Thus, setting this threshold ensures analytical validity.

Data were collected through data mining, a method commonly used to analyze social media interactions with machine learning algorithms (Nisbet et al., 2009). Using Python, 120 sessions were gathered between August 27 and December 24, 2023. The dataset comprises real-time narrations by streamers, viewer comments, and timestamps. Table 2 displays ten examples of tourism live streaming sessions, including their titles, duration, viewer count, and comments.

Insert Table 2. 10 Examples of Tourism Live Streaming Sessions.

Streamers' narratives were converted into textual and temporal data using iFlytek transcription software. Two tourism scholars manually verified the transcriptions. This process involved removing unnecessary content to create an accurate textual dataset for analysis. 14 sessions were later excluded due to incomplete data. The study ultimately focused on 105 sessions, separated into two geographic categories: 56 from China and 49 from international destinations. This division reflects the geographical destinations spread within the chosen sessions.

Descriptive statistics of the 105 sessions were summarized. The focal sessions ranged from 10 to 235 minutes (median: 85 min; mean: 93 min). Streamers' narration contained from 1,053 and 42,675 words (median: 11,482; mean: 14,971). Viewers' comments varied in

length from 426 to 70,226 words (median: 6,201; mean: 13,041). The number of comments spanned between 100 and 10,301 (median and mean: 994 each). The number of viewers per session was between 89 and 45,382 (median: 12,582; mean: 22,174). Figure 3 depicts the distribution of the 105 tourism live streaming sessions by duration.

Insert Figure 3. The Distribution of Tourism Live Streaming Session Length.

Data Analysis

We employed a text-based analysis based on conceptual and methodological considerations. First, language is the primary channel for emotional expression (Rahmani, Gnoth, & Mather, 2019). Real-time viewer comments offer immediate and measurable indicators of emotional reactions (Meng et al., 2021). Although streamers express emotion through gestures and facial expressions, speech remains the dominant medium for emotional communication (Li et al., 2023). Second, by transcribing both streamers' speech and viewer comments into a textual format, we can establish a standardized method for analyzing emotional expressions. Preserving the original timestamps of both the spoken transcriptions and viewer responses enables the tracking of the emotional contagion process. Specifically, a two-step data analysis was conducted, each stage answered one sub-question in this study.

- Detecting Emotional Contagion Process

The first stage concentrated on the emotional contagion process in tourism live streaming. SnowNLP was used to measure streamers' and viewers' emotions separately. The SnowNLP package is a well-regarded Chinese natural language processing library in Python. It has been deemed effective in analyzing emotions on social media (Huang, Sena, Li, & Ozdemir, 2021). An embedded dictionary in SnowNLP measured streamers' and viewers' continuous sentiment scores, ranging from 0 to 1 (higher values denote more positive sentiments). The

model's accuracy was 78%, validating its robustness in identifying streamers' and viewers' emotions.

Secondly, we examined emotional contagions through global dynamic time warping. Pearson and Spearman's correlations were computed before using global dynamic time warping to identify the emotional contagion process in tourism live streaming. The results revealed high correlations between viewers' and streamers' emotions. Table 3 presents descriptive statistics on streamers' and viewers' emotional dynamics during live streaming along with Pearson and Spearman correlation coefficients.

Insert Table 3. Descriptive Statistics and Correlations of Streamers' and Viewers' Emotions.

The emotional states of streamers and viewers can be denoted as $B^1 = b_1^1, b_2^1, \ldots b_p^1, \ldots b_N^1$ and $V^2 = v_1^2, v_2^2, \ldots v_q^2, \ldots v_N^2$, respectively. A matrix was assembled to align these temporal series. The element (p, q) in the matrix signifies the distance $d(b_p^1, v_q^2)$ between the two respective emotional points b_p^1 and v_q^2. The distance $d(b_p^1, v_q^2)$ can be calculated as follows:

$$d(b_p^1, v_q^2) = (b_p^1 - v_q^2)^2$$

A warping path W=W1, W2, ..., Wk represents the mapping alignment of B1 and V2, where k is the number of elements in the path. This warping path is subject to specific constraints, including boundary conditions, continuity, and monotonicity regulations (Kruskall, 1983). This procedure was mainly intended to identify the path that minimized the total warping cost, expressed below:

$$D_{B^1, V^2} = \left(\min \sqrt{\sum_{k=1}^{K} W_k} \right)$$

where D_{B^1,V^2} is the distance between B1 and V2; k is the number of elements in the path; and N < k < 2N-1. The optimal path can then be determined using dynamic programming with the following equation:

$$\gamma(p, q) = D_{B^1,V^2} + min\{\gamma(p - 1,\ q - 1),\ \gamma(p - 1, q),\ \gamma(p, q - 1)\}$$

where $\gamma(p,q)$ is the cumulative distance. This process informed dynamic time warping alignment and the warping matrix, which displayed emotional contagion process between streamers and viewers.

To align sentiment trajectories between streamers and viewers, we used the FastDTW algorithm with Euclidean distance as the similarity metric. The alignment followed standard dynamic time warping constraints, ensuring monotonicity and boundary conditions, which guaranteed that both sequences were aligned from start to finish (Salvador & Chan, 2007). A symmetric step pattern allowed diagonal, vertical, and horizontal moves, preserving temporal coherence throughout the process. FastDTW incorporated a window constraint with a fixed radius of 1, which limited the search space and enhanced computational efficiency (Wu & Keogh, 2020). This choice was appropriate given the one-minute resolution of the data and the gradual nature of sentiment shifts. To verify the robustness of this parameter, we tested additional radii (2, 3, and 4), and the results remained consistent across these variations.

For statistical validation, we conducted a permutation test to assess the significance of the dynamic time warping distances (Good, 2013). We shuffled the viewer time series 100 times and recalculated the distances for each permutation (illustrated in Figure 4). The p-value was determined by the proportion of permuted distances that were equal to or less than the observed value. To aggregate the results across all participant pairs, we applied Fisher's method to combine individual p-values (Poole et al., 2016). This method was suitable due to the independence of participant pairs and the focus on overall synchronization patterns. The

combined test yielded a highly significant result ($p < 0.001$), confirming that the alignment between streamer and viewer sentiment trajectories was not due to chance. These results indicate that emotional contagion between streamers and viewers is facilitated by synchronized emotional responses.

To further analyze causal relationships of streamer-viewer contagions, we employed econometric methods. First, we applied the Granger causality test (Granger, 1969) to examine causality in time series data. The test was conducted for StreamerEmotion and ViewerEmotion using lags from 1 to 20. Table 4 reports the smallest p-value for each test, confirming that Granger causality exists between StreamerEmotion and ViewerEmotion, providing evidence of directional influence.

Insert Table 4. The Results of Granger Causality Test.

Second, we used a panel vector autoregression model to quantify both immediate and persistent effects of emotional contagion (Love & Zucchini, 2006). This model accounts for bidirectional interactions while controlling for external influences. The optimal lag length was determined using the moment and model selection criteria (Abrigo & Love, 2016), ensuring robust estimates. The panel vector autoregression model is specified as follows:

$$\begin{bmatrix} \text{StreamerEmotion}_{i,t} \\ \text{ViewerEmotion}_{i,t} \end{bmatrix} \sum_{p=1}^{p} \begin{bmatrix} \beta_{11}^{p} \beta_{12}^{p} \\ \beta_{21}^{p} \beta_{22}^{p} \end{bmatrix} \begin{bmatrix} \text{StreamerEmotion}_{i,t-p} \\ \text{ViewerEmotion}_{i,t-p} \end{bmatrix} + \mu_i + \varepsilon_{it}$$

Before estimation, we tested for stationarity, heteroskedasticity, and cross-sectional dependence to ensure model reliability. The Augmented Dickey-Fuller test confirmed stationarity in both streamer sentiment (-13.83, $p < 0.001$) and viewer sentiment (-11.44, $p < 0.001$), rejecting the null hypothesis of a unit root. We used the level series in the panel vector autoregression model. White's test indicated no significant heteroskedasticity (2.458, $p = 0.293$), supporting the assumption of constant variance. To account for potential variance

anomalies, we also estimated coefficients using heteroskedasticity-robust standard errors. Given that each live streaming session is an independent event involving different streamers, viewers, and destination contexts, we expected minimal cross-sectional dependence. Pesaran's test supported this assumption (0.271, $p = 0.786$), showing no significant residual correlation across units.

Finally, we analyzed impulse response functions to assess the temporal dynamics of emotional contagion. This method illustrates how a one-standard-deviation shock in one variable influences the other over time, offering a precise assessment of the persistence and magnitude of emotional contagion effects.

- Identifying Emotionally Contagious Topics

The second stage explored the emotionally contagious topics spread by viewers and streamers. Considering that the variety of tourism live streaming destination contexts may cause ambiguity of contagious topics, we took destination backgrounds as a control variable based on the tourism typology. Destinations shown in live streaming were manually classified according to Kirillova et al. (2014) destination categorization procedure. Based on stream titles and descriptions, 105 sessions were categorized into natural scenery, local lifestyles and customs, or historical sites.

The local dynamic time warping was used to specify emotional contagion segments from each live streaming session. Compared with global dynamic time warping, the localized version identified contagion segments and conversations in which streamers' and viewers' emotional evolutions were highly synchronized. The localized dynamic time warping process involves setting a time range for calculation, starting from the current time and extending to the third minute. This range is continuously evaluated iteratively. Localized dynamic time warping distances were subsequently computed between both groups' emotional contagion segments. A threshold was calculated by averaging these distances. Intervals whose local

dynamic time warping distance was below the threshold were considered emotional contagion segments. The emotional contagion segments detected by localized dynamic time warping were next mapped back to destination categories, and conversations during these segments were extracted for topic modeling.

BERTopic modeling was employed to identify emotionally contagious topics. BERTopic applies pre-trained BERT models to generate semantic embeddings that capture the contextual meaning of short texts (Grootendorst, 2022). After tokenizing the Chinese text and removing stop words, the model converted the text into high-dimensional vectors. Dimensionality reduction was performed using uniform manifold approximation and projection to preserve conversational semantics. The text was then clustered using hierarchical density-based spatial clustering. Contextual term frequency-inverse document frequency methods extracted key terms within each cluster to enhance the interpretation of emotional patterns. Topic relevance was further examined through word cloud visualization and ranked topic sorting.

FINDINGS

Process of Emotional Contagions in Tourism Live Streaming

Figure 4 illustrates examples of emotional contagion in tourism live streaming. To standardize the analysis, emotional dynamics were aligned to a consistent 30-minute duration, ensuring uniform live streaming periods. The emotional contagion process encompasses both positive (0.5-1) and negative emotions (0-0.5). The gray lines in the figure represent emotional alignment, indicating the contagion between streamers and viewers. Specifically, emotional contagion can flow from streamers to viewers (1 to 2 in Figure 4a) and from viewers to streamers (1 to 2 in Figure 4c). These processes are integrated with emotionally contagious topics, highlighting the broader emotional contagion mechanism.

Insert Figure 4. The Examples of Emotional Contagion Process in Tourism Live Streaming.

Table 5 reports the panel vector autoregression results. The model confirms a reciprocal emotional influence: streamers shape viewers' emotions, and viewers, in turn, influence streamers. Emotional states also exhibit temporal dependency, as prior emotions significantly predict current ones. This pattern highlights the persistence of affective dynamics throughout the live interaction.

Insert Table 5. The Results of Panel Vector Autoregression Model.

Impulse response functions was calculated using a 20-minute window consistent with the Granger causality framework. In Figure 5, the results show that streamer-to-viewer emotional contagion is stronger and more stable. The effect intensifies after one minute, peaks around ten minutes, and then declines, suggesting a brief lag in emotional contagion. This delay indicates that emotional contagion requires a short period for internalization. In contrast, viewers' emotional influence on streamers is more volatile. The effect emerges quickly, weakens after two to three minutes, briefly resurges at the sixth minute, and gradually fades.

These fluctuations suggest that streamers respond to viewers' emotions in distinct phases. Unlike the sustained impact of streamers on viewers, the viewers' influence varies with content pacing and possibly platform-level interventions (Chi et al., 2025).

Insert Figure 5. The Results of Impulse Response Function Over Time.

The emotional tone set by streamers plays a crucial role in digital emotional contagion, influencing how viewers align their emotions in real-time. When viewers observe the emotional expressions of streamers, they often replicate these emotions, particularly positive ones. This emotional mimicry becomes evident in the textual interactions, where viewers echo the streamer's sentiments, language, and symbols. For instance, when a streamer comments on the beauty of Huangshan, saying, "Huangshan's landscapes are always amazing, transforming with the seasons and varying weather," viewers mirror these feelings through positive responses like " 👍 " or remarks such as "I've taken pictures here. It's still so beautiful!" and "No doubt!". This synchronous emotional exchange highlights emotional alignment, creating a shared emotional experience among viewers (Higgins & Hamilton, 2019).

Positive emotional contagion typically outlasts negative contagion, as online participants contribute emotionally in a sustained and reciprocal manner. The cumulative effect of positive expressions strengthens the contagion cycle, enhancing collective emotional engagement. Such exchanges often arise spontaneously during unscripted moments in live streaming (Páez et al., 2015). For instance, when a streamer humorously noted the absence of his partner while awaiting a boat ride on the Seine River, he joked, "Oh no, where's Gigi? Did she ditch me for gelato?" This playful remark quickly sparked emotional synchronization. Viewers, drawn to the humor, mirrored the sentiment with mimetic responses and cheerful emojis. Some even responded with similar jokes, saying, "If it were

me, I’d leave you too for gelato." This rapid cycle of emotional mimicry highlights digital viewers’ receptivity to positive emotions and underscores the interactive nature of online contagion. As these exchanges continue, streamers and viewers form stronger emotional bonds, prolonging and deepening positive contagion (Goldenberg & Gross, 2020).

Negative emotional contagion tends to be less intense and frequent than positive emotions. However, once initiated by a streamer, it can still spread widely among viewers. In tourism live streaming, negative emotions often arise from historical or cultural narratives, where streamers share emotionally charged stories. Unlike positive contagion, these narratives evoke gradual emotional alignment rather than immediate mimicry. For example, when a streamer recounted the political upheaval of the Qing Dynasty in 1900 and the imperial family’s downfall, viewers not only absorbed the historical details but also its emotional undertones. This led to collective expressions of sadness and reflection, such as “The death of Consort Zhen is heartbreaking” and “This seems like a classic case of political evolution.” The streamer reinforced this alignment through affirmations like “Yes, indeed!” and “That's sad,” thereby sustaining the collective emotional response. Negative emotional synchronization endures primarily through validation, especially in discussions tied to historical or cultural contexts. In these settings, shared emotions deepen engagement and amplify the broader influence of digital emotional contagion.

The interplay between positive and negative emotional contagion in tourism live streaming is a dynamic process shaped by streamers and viewers. Negative emotions, once expressed by viewers, do not persist on their own but are influenced by others' responses. Streamers who validate these emotions may unintentionally amplify them. However, when streamers strategically reframe negative content, they can shift the emotional tone, transforming negativity into constructive discourse. For example, when a streamer presented traditional herding practices, some viewers criticized it as "too cruel." Instead of reinforcing or

challenging these concerns, the streamer redirected the discussion to the practice's historical and cultural context. This reframing not only diminished the intensity of negative emotions but also guided the conversation toward cultural appreciation. Positive contagion can counteract negative emotional shifts. Some viewers act as emotional moderators, offering reassuring comments like "Don’t worry" or "The horses don’t feel much." Such responses help diffuse tension and restore emotional equilibrium (Segura, Attali, & Magee, 2017). These interactive dynamics demonstrate that emotional contagion in live streaming is an active, evolving exchange driven by collective engagement, not a passive process.

Emotionally Contagious Topics Spread by Tourism Live Streaming Participants

Several emotionally contagious topics were identified from three tourism live streaming scenarios. Emotionally contagious topics from viewers and streamers were, therefore, treated separately under each destination category. Table 6 and Table 7 show the emotionally contagious topics spread by streamers and viewers, respectively.

Insert Table 6. A Summary of Contagious Topics from Streamers.

Insert Table 7. A Summary of Contagious Topics from Viewers.

- Contagious Topics in Historical Scenario

Streamers discussed three emotionally contagious topics during their discussions of historical scenarios: royal family struggles, the political strategies of Chinese emperors, and the connotation of historical artifacts.

The most contagious topics among streamers were historical artifacts and their connotation (30.37%, 84 times), triggering 584 emotional responses from viewers. When streamers discussed ancient relics, including their origins, symbolism, and physical features such as “Jade block,” “Confucius Temple,” “pavilion,” “magnificent,” and “Changchun Garden,” viewers experienced heightened emotions, often becoming excited and engaged. These emotions spread as viewers mirrored the streamers' intense appreciation for ancient architecture and relics, imagining the lives of people from earlier times.

The political strategies of Chinese emperors constituted the second most discussed topic (14.87%, 47 times). Streamers presented the complexities of Chinese history, including dynastic shifts and cultural evolution, capturing viewers' attention and triggering emotional responses. They used terms such as "Kill and decide," "Calm and witty," "perceptive," "careerist," and "Emperor Yongzheng" to provide insight into the characters, ruling approaches, and political maneuvers of these figures. Through detailed assessments of historical figures' lives and thought processes, streamers evoked strong emotional connections from viewers, who then mirrored the emotions displayed.

The royal family's struggles emerged as the third most emotionally contagious topic (8.22%, 26 times). Streamers narrated the personal and familial conflicts of historical figures with poignant detail, drawing viewers into the emotional depth of these accounts. Keywords like "son," "cheerful," "mother," "wife," "breakdown," and "marriage" resonated with viewers, prompting them to reflect on their own family dynamics. This familial lens provided a

relatable perspective, fostering emotional engagement and creating a sense of reality that resonated with viewers' everyday concerns.

In historical scenarios, emotionally contagious topics (e.g., Chinese philosophy and ancient social systems) often spread from viewers to streamers, triggering emotional contagions in the latter. Chinese philosophy discussed by viewers evoked the most vital emotional contagions in streamers (34.00%, 84 times). Viewers shared ancient Chinese philosophical thoughts and traditional worship activities in historical dynasties, expressing reverence for heaven and the cycle of fate (e.g., "heavenly fairy," "human," "nourish the heart," "Divine Will," "humanity," "the cosmos," and "heaven"). Such emotional debate rooted in Chinese philosophy, such as Buddhism and Taoism, aroused positive feedback and emotional contagions from streamers. The streamer engaged and expressed emotions similar to those of viewers, who appreciated Chinese philosophical thoughts.

Moreover, ancient traditions and rituals (e.g., gender roles, fairness, and social expectations) capture streamers' emotional attention (12.95%, 32 times). Viewers often engaged in discussions about the influence of traditional culture and secular beliefs on people's lives and thoughts during that era. They shared insights into daily life in ancient societies, highlighting themes like "wealth and prosperity," "gender distinctions," "family roles," "poverty," "social hierarchy," "imperial examinations," and "suffering." These emotional expressions from viewers prompted streamers to empathize, connecting historical experiences to modern issues. This relatability fostered a stronger bond between streamers and viewers, amplifying emotional contagion. Figure 6 illustrates emotionally contagious topics in the historical scenario.

Insert Figure 6. An Illustration of Emotionally Contagious Topics in Historical Scenario.

- Contagious Topics in Local Cultures and Lifestyles Scenario

Streamers mainly used two emotionally contagious topics to engage with viewers in local culture and lifestyle scenarios: Asian destination comparisons, and Western aesthetics and cultures.

Asian destination comparisons were this scenario's most popular contagious topics (23.41%, 74 times). Streamers compared cultural differences and cityscapes across multiple Asian tourism locations, like Hong Kong, Singapore, and Korea, with terms such as "crowded," "busy", "cultural characteristics", and "traditions." The positive emotional expressions of different Asian destinations captivated viewers' interests, guiding viewers' emotions to align with streamers. Meanwhile, ancient and modern tourist destinations were also compared by streamers, with references to historical settings like "ancient city" and "historic," as well as contemporary city views such as "metropolis," "developed," and "well-planned." By interpreting the positive transformation of historical places into modern urban landscapes, streamers invited viewers to positive emotions to viewers', leading to emotional contagion among viewers.

Additionally, viewers emotionally resonated with streamers' sharing about Western aesthetics and cultures (14.87%, 47 times). Within this topic, streamers expressed their amazement at Western geographic characteristics (e.g., "Italy," "Greece," "Socrates," "river," "culture," "civilization," and "Renaissance"). Streamers also expressed their appreciation of Western cultures and arts using words like "passion," "sensation-seeking," "pioneering," and "artistic sense." The discussions connected viewers' ideological and emotional experiences with Western cultures and art, encouraging them to express emotions and be exposed to streamers' emotional interpretations (Breitsohl & Garrod, 2016).

Living conditions and infrastructure in Asian countries spread by viewers resonated with streamers (36.03%, 89 times). Viewers commented on local people's lives and discussed

concerns about the costs of living in cosmopolitan cities: "living costs," "luxury," "salary," and "thrifty." This discussion among viewers inspired streamers to empathize with life issues following viewers' emotions (Higgins & Hamilton, 2019). Inspired by viewers, streamers were emotionally worried about local development conditions and contemporary issues related to livelihood, such as "currency," "pressure," "residences," "poor," and "houses." Similarly, discussions surrounding Western customs and lifestyles (10.12%, 25 instances) trigger emotional responses from streamers. Viewers share positive experiences tied to cultural traditions in Western countries, such as "Thanksgiving," "art," and "Christmas." These holidays often evoke personal, emotional memories (Servidio & Ruffolo, 2016), which lead to streamers connecting emotionally with these shared experiences. As streamers become more attuned to the cultural norms and customs of viewers, they develop a stronger emotional bond with their viewers. Figure 7 illustrates the emotionally contagious topics in local cultures and lifestyle scenarios.

Insert Figure 7. An Illustration of Contagious Topics in Local Cultures and Lifestyles Scenario.

- Contagious Topics in Natural Scenery Scenario

Streamers and viewers each disseminated one emotionally contagious topic in natural scenery scenarios. To viewers, streamers' appreciation of scenery and beauty was emotionally contagious (8.22%, 26 times). Streamers discussed landscapes' visual attractiveness, enjoying proximity to or immersion in nature as a dominant conversation. This topic elicits viewers' emotional contagions to appreciate aesthetic landscapes (Kirillova et al., 2014). Inspired by streamers' emotional descriptions of natural views, viewers widely appreciated the beauty of mountain and river scenes, such as "summer", "fun", "winter", and "cherry blossoms." Streamers resonated with viewers' worship for natural creations (6.88%, 17 times). Viewers expressed positive emotions such as "auspicious," "prosperity", "👏," "fair winds," and emoji symbols while admiring nature's creations. Moreover, viewers also showed their positive emotions around worship, kindness, and wishes to their God with their appreciation of the beauty of natural wonders, like "striking," "blessed," "glacier," and "impressive." These shared positive emotions were conveyed to streamers through real-time feedback, thereby contagious to streamers' emotions. Streamers' workshop and respect for nature and God were therefore aroused and expressed to the online community. The shared emotional experiences reflected unified emotional alignments and communal focus in tourism live streaming. Figure 8 illustrates the emotionally contagious topics in natural scenery scenarios.

Insert Figure 8. An Illustration of Contagious Topics in Natural Scenery Scenario.

DISCUSSION

- Process of positive and negative emotional contagions

Our findings suggest positive and negative emotional contagion processes in tourism live streaming. The emotional fluidity reflected in the positive and negative emotional contagion process attests to the growing recognition of irrationality in social interactions (Joo & Woosnam, 2020). Prior tourism research on digital emotional contagion has primarily examined emotions as outcomes or precursors of individual and corporate transactions (Luo, Liu & Wan, 2023). These studies often assess the type and value of emotions based on existing commercial or product attributes (Luo, Liu, & Wan, 2023; Hsiao et al., 2022). In contrast, our study shifts the focus to the non-transactional dimensions of emotional transmission. We highlight how the digital emotional contagion process in tourism live streaming creates value beyond economic or utilitarian considerations. Emotions are unconsciously absorbed through emotional contagion without rational judgments, harmonizing individual feelings into a collective emotional atmosphere (Chung & Zeng, 2020). During these emotional contagions, tourism live streaming can be conceived as the social marketplace where emotional energy functions as a currency equivalent (Joo et al., 2023). This perspective explains why individuals engage in emotional, symbolic, and value-oriented behaviors (e.g., altruistic activities) contrary to their economic interests (Barsade, 2002).

Unlike prior research that primarily highlights emotional contagion through non-verbal cues such as facial expressions and body language (Hsiao et al., 2022; Li et al., 2025; Woo & Chan, 2020), our study reveals that digital emotional contagion also transpires through text-based interactions. This broadens the current understanding of emotional contagions beyond the reliance on non-verbal signals. In real-time exchanges, streamers and viewers actively

synchronize emotions, often echoing key phrases and using corresponding emojis. Previous studies attribute this synchronization to cognitive-emotional delays, engagement patterns, and feedback loops (Schoner-Schatz et al., 2021; Yin et al., 2024). Our findings support the notion that linguistic and symbolic imitation play a significant role in digital emotional contagion (Lee & Theokary, 2021). However, earlier work predominantly views emotion as a response to streamer-generated content (Li et al., 2023; Luo et al., 2023). In contrast, we argue that emotion is co-created and synchronized through active interaction. By emphasizing the real-time, multi-directional communication between streamers and viewers, this study challenges traditional linear models of emotional transmissions.

Additionally, the results highlight the dynamic nature of emotional contagion in live streaming, revealing an asymmetry in the flow of positive and negative emotions. Positive emotions spread more consistently, intensely, and frequently than negative ones, indicating that emotional contagion does not mirror emotions but follows an adaptive trajectory (Hatfield et al., 2014). Continuous emotional contagions between streamers and viewers sustain collective emotional elevation (Servidio & Ruffolo, 2016). Unlike previous research that isolated positive and negative contagion (Yin, Cheng, & Ni, 2024), our study shows their interconnection and reciprocal influence. Streamers' emotional expressions affect viewers' emotions and vice versa. Although negative emotions can momentarily disrupt positive contagion, collective engagement often restores positivity. Positive contagion plays a regulatory role, regulating emotional intensity and fostering online community cohesion (Su et al., 2022). Our findings challenge prior studies that viewed emotional contagion as a static status (Breitsohl & Garrod, 2016; Zhou et al., 2020). We show that tourism live streaming facilitates a dynamic and co-constructed emotional contagion process, where emotions fluidly interact, shaping engagement and strengthening social bonds (Meng et al., 2022; Xu et al., 2025).

- Emotionally contagious topics across destination scenarios

Furthermore, our findings reflect the emotionally contagious topics in different destination scenarios. Unlike exotic and natural scenery scenarios, historical scenarios more readily evoke emotional contagions and mimicry among viewers. This is followed by two topics centered around exotic cultures and local lifestyles and one about appreciating natural sceneries. Although the topics that trigger emotional contagions vary across different destination contexts, they share an important commonality: comprehensibility. This finding aligns with previous research by Lu and Gursoy (2015), emphasizing that the complexity of processing tourism information is essential for emotional transmission. Complex information can reduce comprehension, making emotional contagions more challenging. For example, our study found that the discussions about historical sites' external architecture and aesthetic structures most frequently elicited emotional contagions from viewers. This is because emotional discussions related to architectural design and cultural heritage are more intuitive and easily grasped by the viewers, leading to a faster spread of emotional contagion. In contrast, more in-depth discussions about historical struggles and cultural developments may overwhelm viewers emotionally (Martin & Woodside, 2014), resulting in lower frequencies of emotional contagion among online participants.

On the other hand, the proportion of positive emotional contagions is higher in natural scenarios than in historical and lifestyle scenarios. Conversely, the topics shared in historical scenarios that trigger emotional contagion are more likely to evoke negative emotional contagions. This indicates that emotional contagions can produce different frequencies of positive and negative emotions depending on destination scenarios. The distribution of contagious topics in destination scenarios is consistent with previous research on tourism experiences, suggesting that different attractions provoke different emotional fluctuations (Kim & Fesenmaier, 2015; Nawijn et al., 2013). Natural scenery and local lifestyles

constitute positive emotions and relaxation, making positive emotional contagion more likely to spread. On the other hand, historical scenarios often involve complex and heavy emotions (Akgün et al., 2020), which may inherently carry persistent negative emotional contagion. Figure 9 illustrates the emotional contagion mechanism in tourism live streaming, highlighting the dynamic exchange of emotions between streamers and viewers. Streamers initiate emotional contagion through storytelling, while viewers engage via comments, emojis, and discussions. This emotional contagion flows in multiple directions: from streamers to viewers, viewers to streamers, and reciprocally among viewers. Positive emotional contagion unfolds gradually, lasting longer and reinforcing itself, whereas negative contagion is often abrupt and short-lived. Both forms interact through emotionally charged topics, influencing the overall emotional atmosphere of the session. This cyclical process fosters sustained emotional engagement, creating an immersive environment where participants co-create and share emotions (Xu et al., 2025).

Insert Figure 9. Conceptualizing Digital Emotional Contagion Mechanism in Tourism Live Streaming.

COCLUSION AND IMPLICATIONS

Tourism live streaming has become a prominent platform for real-time emotional exchanges and viewer engagement (Deng et al., 2021). Despite the importance of emotional interactions in driving viewer engagement, they have received limited attention in tourism research. Especially emotions in live streaming are freely exchanged and synchronized among participants, often resulting in digital emotional contagion (Goldenberg & Gross, 2020). However, this phenomenon remains underexplored in tourism studies, and there is insufficient understanding of how it unfolds in tourism live streaming. Given its potential to enhance viewer engagement and online community building, understanding emotional contagion in this interactive environment is crucial. Thus, this study analyzes the emotional contagion process across 105 live streaming sessions.

This study reveals that emotional contagion in tourism live streaming is interactive, multidirectional, and dynamic. Both positive and negative emotions expressed by streamers or viewers can initiate emotional contagion. Online participants, through real-time interactions, receive, mimic, and amplify these emotions. Furthermore, emotional shifts occur during interactions, highlighting the fluidity of emotional exchanges. Viewers play a crucial role in shaping the emotional atmosphere, influencing both streamers and other viewers. Streamers, as primary conduits of live streaming content, hold significant power in managing the duration of negative emotional contagion. Emotional contagion is further shaped by the topics. These topics vary across different destination contexts. These emotional interactions lead to both positive and negative emotions converging, facilitating contagion among streamers and viewers.

Theoretical Implications

This study makes several contributions to the existing literature. First, our research advanced the understanding of the digital emotional contagion mechanism. While previous tourism research has primarily focused on the emotional states that result from digital emotional contagion (Zhang et al., 2023), these studies often neglected to verify whether the emotions experienced by individuals were synchronized with those of others. Such synchronization is a critical indicator of emotional contagion (Hatfield et al., 2014). This study addresses this gap by exploring how online participants align their emotions with others. Specifically, it demonstrates how emotions are synchronized through a sequence of sharing, perceiving, imitation, and feedback.

Our study demonstrates that digital emotional contagion can emerge through text-based communication in tourism live streaming. While previous tourism research has focused on facial expressions and vocal tones as primary contagion channels (Li et al., 2025), our findings highlight the significant role of real-time comments in facilitating emotional exchange. This form of contagion is characterized by interactivity and immediacy, unfolding through rapid, reciprocal responses that generate shared emotional momentum. By examining text-based interactions, our study broadens the conceptual understanding of emotional contagion, showing how it can flow synchronously and multi-directionally. Unlike traditional face-to-face encounters, digital emotional contagion can occur in the absence of physical presence or non-verbal cues. These insights provide a novel perspective on digital emotional contagion in social media (Kucukergin & Uygur, 2019; Woo & Chan, 2020).

This study theoretically consolidated our understanding of positive and negative emotions in digital emotional contagions (Lee & Theokary, 2021). We indicated that positive and negative emotions that online participants expressed could develop into emotional contagions, and these positive and negative emotional contagions were interconvertible due

to the continuous emotional inputs of streamers, viewers, and fellow viewers. Moreover, this study expands on previous research that only examined either positive or negative emotional transmission on social media. We compared the positive and negative contagion processes, and amplified that positive and negative emotional contagion operate differently. Specifically, this study suggests that positive emotional contagions spread more easily and persist longer than negative ones. Negative emotional contagions usually last shorter and rely on streamers' responses. This finding enriched the understanding of positive and negative emotional contagion in general social media by highlighting the complexity of emotions, extending the one-sided focus on negative emotional contagion in tourism literature (Zhai et al., 2019).

Fourthly, we explained the emotionally contagious topics spread by different online participants. Previous tourism studies seldom examined contagious topics on social media, resulting in limited knowledge of emotion-driven conversations. Looking into the emotionally contagious topics in tourism live streaming, we indicated that positive and negative emotions can be spread and flow toward different social media parties (i.e., streamers, viewers, and fellow viewers) over emotionally contagious topics. These contagious topics act as emotional chains to interconnect social media users' emotional energy and focus. Our findings also advanced our understanding of shared interest and emotional fluidity across historical, cultural, and natural destination scenarios. Moreover, our findings suggest that the emotional contagion valences triggered by streamers and viewers' conversations differ, even if they co-experienced and shared the same conversation flows. These findings thus provide new evidence of the conjunctional literature between emotional contagion and online interactions (Zhang et al., 2022).

Our study enhances the literature on tourism live streaming by exploring emotional contagion during live sessions. Previous research mainly focused on participant motivations and post-

viewing behavioral intentions (e.g., Song et al., 2023; Xie et al., 2022), while overlooking dynamic emotional exchanges in the community. This study deepens understanding of emotional interactions within tourism live streaming by examining the fluid, multi-directional contagion process between streamers, viewers, and fellow viewers. Our findings reveal that streamers act as initial emotional conduits, but viewer-to-viewer interactions also play a key role in sustaining emotional contagion. This research empirically confirms the interactivity, multi-directionality, and fluidity of emotional contagion in tourism live streaming, where participants continuously exchange, mirror, and co-engage in emotions (Herrando & Constantinides, 2021).

Practical Implications

By uncovering the process of positive and negative emotional contagion in tourism live streaming interactions, this study provides three practical contributions for tourism marketers. Firstly, media operators and platform stakeholders should view negative emotional contagion as a strategy for enhancing viewer engagement rather than uniformly categorizing it as harmful. Traditionally, tourism live streaming stakeholders and media marketers often focus on transmitting positive emotions. Instead, negative emotions were considered obstacles to viewer engagement, leading to the suppression of practitioners. This study suggests that practitioners and media operators should adopt a dialectical view of positive and negative emotional contagion. Unlike the negative emotions associated with specific crises, the positive and negative emotional contagion in real-time interactions originates from online content consumption (e.g., destination cultures and streamers' oral interpretations) and is mutually propagated through real-time interaction. Therefore, negative emotional contagions can also be a manifestation of viewers' emotional investment and engagement. Online platform operators should avoid suppressing negative emotional contagions solely due to their negativity, as this could limit the emotional exchange among online participants

(Potdevin, Clavel, & Sabouret, 2021). For instance, this study indicates that negative emotional contagion in online interactions related to historical stories and local cultures does not signify dissatisfaction with the destination or its products but reflects viewers' emotional reflection on cultural history and daily life. Thus, tourism live streaming stakeholders and media operators can leverage negative emotional contagions in appropriate historical and exotic cultural scenarios to increase viewers' emotional engagement.

Moreover, we urge tourism practitioners to recognize emotional contagion's fluidity and mutual nature in tourism live streaming. Tourism stakeholders should initiate live polls, Q&A sessions, and emotional prompts that encourage viewers to share their personal reflections and emotional responses to cultural narratives or historical stories. For instance, when discussing a destination's heritage or controversial history, streamers can invite viewers to express their thoughts and feelings, making the interaction reciprocal and creating a space for emotional conversations. Additionally, integrating real-time reactions (e.g., emojis, live comments) with destination-related storytelling helps intensify the emotional contagions of the content, making the experience more immersive (Zhang et al., 2023).

Additionally, this study suggests that online influencers and streamers tailor content design for emotional impact. Streamers can strategically introduce such topics to stimulate emotional responses from their viewers. For instance, historical topics tend to provoke more negative emotions compared to natural scenery, which is linked to positive emotional contagion. Tourism marketers should design content around these emotional patterns, tailoring their approach based on the emotional dynamics of specific destination types. Historical and cultural narratives, which tend to evoke more intense emotional reactions, should be framed carefully to ensure that they do not overwhelm viewers. On the other hand, content focused on natural sceneries should prioritize uplifting emotions to maintain viewer engagement.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations that need to be acknowledged and addressed in future research. First, real-time data were collected during tourism live streams to preserve the emotional contagion process, but participants were not asked to assess their emotions before, during, or after the interaction. This limits insight into their subjective interpretations and may reduce the accuracy of emotional analysis. Without direct interpretations from streamers and viewers, emotional meaning was inferred solely from observable behavior, introducing potential bias in interpretation.

Second, we focused on streamers' and viewers' emotional expressions in the emotion cycle instead of felt emotions. Although the present findings support the existence of positive and negative emotional contagion in tourism live streaming contexts, we could not determine the extent to which the felt emotions were expressed and whether their emotional expressions might influence the strength of emotional contagion processes.

Thirdly, future research can consider discrete emotions (e.g., anger, joy, and anxiety) rather than simply their positive and negative valence during emotional contagions. Emotions have different relational meanings and may be perceived by streamers and viewers differently, prompting distinct reactions. We recommend further research to examine how the contagion of various discrete emotions differs and how online content creators targeting these discrete emotions might facilitate long-lasting viewer engagement.

Additionally, future research should examine the long-term effects of emotional contagion on viewers’ behavior. Exploring its impact on viewer retention, brand loyalty, and e-commerce purchasing behavior could offer valuable insights into the enduring influence of digital emotional contagion on user engagement and business outcomes

This study primarily focuses on textual data to examine emotional mimicry and synchronization. However, the design of social media platforms, along with streamers' non-verbal cues (e.g., gestures, facial expressions) and environmental factors (e.g., background visuals, lighting, setting), all influence digital emotional contagion. Future studies should use multimodal methods, combining textual, visual, and auditory data, to provide a more holistic analysis of this phenomenon.

Methodologically, future research could incorporate biological measures to explore real-time emotional contagion (Li et al., 2025). Tools such as eye-tracking, facial expression analysis, and electroencephalography can offer deeper insights into the unconscious mechanisms driving emotional mimicry and synchronization in digital contexts.

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