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Emotional resonance and rational reflection in hybrid space: a cross-platform study of public opinion evolution in youth digital collective action

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Abstract

Objective/Background Social media has become deeply integrated into urban life, and digital collective actions by young people rooted in physical spaces are becoming increasingly common, posing new challenges to urban governance. There is an urgent need to understand the dynamic evolution of cross-platform public opinion in such events to provide a basis for precise governance.

Research process/Methodology Taking the “Night Riding to Kaifeng” incident as an example, this study integrated 27,216 data points from the Weibo (mass communication) and Zhihu (knowledge community) platforms. Using the life cycle theory to divide public opinion into stages, the study analyzed public emotions at each stage using the emotion dictionary and employed the LDA topic model to explore the evolution of themes.

Research conclusion/Results The study found Weibo exhibited “emotional resonance” with dominant positive emotions, effectively mobilizing offline action, while Zhihu featured diverse emotional profiles with rational debate emphasis. Grounded in collective action theory and urban social movement theory within hybrid space, this research uncovered the organizational logic and cross-platform expression patterns of emergent youth collective action in social media contexts.

Research value/Significance This study deepens understanding of public opinion complexity in collective emergency incidents within social media contexts, offering empirical and theoretical foundations for multi-tier early warning systems, agile collaborative governance, and youth-inclusive resilient urban development.

Keywords Mass emergencies, Emotion analysis, Theme mining, Hybrid space

1 Introduction

Amid rapid urbanization and social media integration, mass incidents in urban areas frequently trigger intense online public opinion. As a “barometer” of social

sentiment and a “guidepost” for governance, this online discourse profoundly shapes public perception and reveals pressures on urban systems and public demands (Hong et al., 2024; Wang, 2024; Zhan, 2023). Compared to general emergencies, group incidents involving conflicting interests or demands amplify public emotion and debate. Understanding the evolution of such public opinion is crucial for urban managers to effectively respond, alleviate operational pressures, optimize governance, and prevent risk escalation.

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Social media are now primary venues for public opinion. While research on group incident opinion has established foundations—focusing on evolution stages (Zang et al., 2025; Zhao & Gao, 2025), sentiment analysis (Gao & Wu, 2025; Liu et al., 2025), and topic mining (Han & Liu, 2025; Zhang & Liu, 2025)—significant gaps remain. First, studies often analyze single platforms (e.g., Weibo), lacking multi-platform data integration to capture cross-platform differences and connections. Second, systematic analysis of opinion characteristics and evolution for specific event types—particularly youth-driven, culturally symbolic incidents—remains insufficient. Crucially, existing research largely fails to examine these events systematically through collective action or urban social movement theory frameworks, neglecting their nature as digital urban collective expression and their potential contribution to urban governance theory. This hinders translating findings into enhanced precision for urban governance and public space incident response.

The “Night Riding to Kaifeng” incident, a spontaneous youth-led event organized via social media impacting urban space, exemplifies a new digital-era collective action. While traditional theories (McCarthy & Zald, 1977; McAdam, 1982) emphasize organization and political opportunity, connective action theory (Bennett & Segerberg, 2013) highlights social media’s role in enabling decentralized mobilization through personal narratives. Urban social movement theory focuses on contesting the “right to the city”, including space use and cultural expression. This incident uniquely bridges both dimensions: originating from individual action (eating soup dumplings), it leveraged digital connections (short videos/social media) to mobilize tens of thousands. Its core action—occurring on the Zhengkai Avenue—directly challenged urban traffic management, public space rules (shared bikes, road use), and resource allocation, while expressing youth subculture (freedom, adventure). Analyzing its cross-platform public opinion evolution thus serves not only crisis management but also provides a key case study for understanding how digital natives use social media to organize and express spatial demands and cultural identity within cities.

Focusing on the “Night Riding to Kaifeng” incident, this study integrates public opinion data from Weibo (mass communication) and Zhihu (in-depth discussion) through an urban public space governance lens. We systematically trace sentiment dynamics across the opinion lifecycle, explaining shifts via a mixed-space perspective; deeply explore and track the core themes of public discussion and their evolutionary paths and analyze the public opinion performance of the two major platforms based on collective action theory and urban social movement theory. This analysis deepens understanding of

youth-led, culturally symbolic digital collective action within cities, providing empirical insights for theory development and informing strategies to enhance urban resilience in responding to similar public space incidents.

2 Literature review

Effective online public opinion management during mass emergencies is crucial for urban safety resilience, requiring precise deconstruction of spatiotemporal sentiment differences and thematic evolution. While existing research provides foundational insights into opinion lifecycle stages, sentiment analysis, and topic mining, significant gaps persist—particularly in multi-platform integration, and incident-specific investigations.

2.1 Division of stages in the evolution of public opinion

Life cycle theory—analagizing public opinion to biological birth, growth, maturity, and decline—remains the dominant framework for stage division (e.g., three-/four-/five-stage models). These models have been widely used to analyze the evolution of public opinion in various types of emergencies, such as public health incidents (Xie & An, 2022; Chen et al., 2024), disasters (Li & Wu, 2024), and social security incidents (Lu et al., 2022), effectively depicting the macro trend of public opinion intensity over time. This research paradigm is highly consistent with urban complex system theory and resilience research. As a key response of the urban social subsystem to shocks, the lifecycle stages of public opinion reflect the dynamic changes in the urban social psychological state, information flow patterns, and governance priorities. The outbreak phase corresponds to the emergency decision-making stage of urban emergency management, the mature phase reflects the deepening of social issues and the need for adjustments to governance strategies, and the decline phase is associated with the formation of urban social memory and the shaping of long-term resilience. However, current studies often remain descriptive, failing to embed opinion evolution within urban complex system dynamics or resilience frameworks, thereby isolating stage transitions from governance interactions.

2.2 Public opinion sentiment analysis

Public opinion emotion analysis identifies the emotional characteristics and patterns of each stage of an incident’s evolution by mining public comments on social media, providing a key basis for emotional guidance in urban governance. Current research is deeply integrated with urban governance scenarios: at the spatial perception level, Xiao et al., (2022) used geotagged microblogs and deep learning models to map the emotions of Nanchang citizens in space and time, revealing the positive emotion aggregation effect of spaces such as commercial districts

and parks; at the policy response level, Chen et al., (2023) assessed the social acceptance of city lockdown and unlocking measures based on Twitter emotion analysis, providing data support for resilient governance; at the emergency management level, Han et al., (2024) developed a fusion model on the Douyin platform to identify “fear-dominated” emotions during disasters, aiding in rumor control, while Wan et al., (2025) analyzed public emotions before, during, and after the Zhengzhou flood using a customized disaster dictionary, and proposed a psychological-behavioral coordination strategy by linking emergency behaviors; in the realm of risk governance, Wu & Li (2024) developed a risk dictionary for the social safety domain, enabling early warning from negative semantics to safety risks. However, existing research often focuses on single platforms, with insufficient cross-platform studies; most research emphasizes the statistics of sentiment polarity, with insufficient exploration of the micro-mechanisms of how emotions interact with specific issues and drive shifts in public opinion.

2.3 Public opinion theme mining

Public opinion theme mining serves as the decision-making foundation for enhancing urban governance efficiency, with its core focus on systematically deconstructing the evolution of situations, thematic logical associations, and spatial contradictions (such as competition for public resources and blind spots in municipal management) within public events. Methodologically, theme analysis methods (Xie et al., 2022) coexist with structural modeling techniques. For instance, the BTM theme model (Wang et al., 2024) and the word2vec model (Zhu et al., 2022) are widely applied for theme mining and extraction. However, when it comes to exploring public opinion themes, LDA-related theme models are more commonly used for theme classification. For example, Liu et al., (2024), Xue and Zhang, (2024), Chen et al., (2022), and others have used Weibo information about incidents as research samples and adopted theme models such as LDA, OLDA, and BERT-LDA for theme mining to accurately identify the characteristics of public opinion themes. However, current research has certain limitations: data platforms rely heavily on Weibo and ignore knowledge communities such as Zhihu, making it impossible to capture the impact of cross-platform thematic differentiation on urban policy-making; systematic research on specific types of group emergencies (especially incidents spontaneously formed by youth groups with cultural symbolic significance) is still insufficient; and the perspective of key urban daily governance is missing, urgently needing to be integrated into urban theoretical frameworks such as mobility governance.

3 Research method

3.1 Emotion analysis

Emotion analysis plays an important role in public opinion analysis, as it can help us accurately identify the public’s emotional tendency towards an event, such as positive, negative, or neutral, so as to judge the overall emotional atmosphere and possible development trend of public opinion. At present, the methods for text emotion analysis mainly include those based on emotion dictionary and those based on machine learning (Zheng et al., 2024).

Emotion dictionary-based methods classify the emotion polarity of the analyzed statements mainly based on the polarity of the sentiment words in the emotion dictionary (Zhu et al., 2024). The emotional tendency of the text is inferred by matching the words appearing in the text with the words in the emotion dictionary and calculating the number or weight of positive and negative words. Commonly used emotion dictionaries include the GooSeeker Emotion Dictionary, SnowNlp Emotion Dictionary (Shao & Chung, 2024), Boson Emotion Dictionary (Zhou et al., 2024), etc. Machine learning-based methods convert text into vector representations, and then categorize the text using machine learning algorithms (e.g., Naive Bayes, Support Vector Machines, Decision Trees, etc.).

Usually, machine learning-based emotion analysis methods need to spend a lot of time on prior labeling and classification for emotion analysis, while emotion analysis methods based on emotion lexicon do not require a lot of labeling work and are easy to expand and update the lexicon, which can quickly and efficiently score large-scale public opinion data for emotion scoring and provide basic data support for public opinion analysis.

3.2 LDA topic modeling

LDA topic model is a typical bag-of-words model proposed by Blei et al., (2003), which is commonly used to identify potential topic information in large document sets or components, and give the topic of each selected document as a probability distribution (Pu et al., 2022). And LDA is an unsupervised model (Zhang & Zhang, 2022), which does not require topic information in the documents, and the documents are not labeled with topics or keywords, and is widely used in the fields of topic discovery, user recommendation, food authentication, and disease recognition (Jin et al., 2023; Li et al., 2025; Ma et al., 2024; Song et al., 2023; Wu & Mu, 2023).

LDA theme modeling, on the other hand, is capable of extracting potential theme information from massive public opinion texts, revealing hot topics and discussion focuses of public concern, and helping us understand the main content and development direction of public

opinion. For example, in the “Night Riding to Kaifeng” incident, through the LDA theme model analysis, we can find that the public’s discussion has gradually expanded from the incident itself to safety, transportation, culture and other aspects, so that we can take targeted measures to guide and control the situation.

The index of perplexity is often used to judge the effectiveness of LDA topic models. The lower the perplexity degree, the better the topic classification effect, the better the generalization ability of the model. The number of topics can be determined by calculating the perplexity degree. The LDA probabilistic model and the formula for calculating the perplexity degree are as follows:

$$p(\theta z, w | \alpha, \beta) = p(\theta | \alpha) \prod_{n=1}^N p(z_n | \theta) p(w_n | z_n, \beta) \quad (1)$$

where θ is the document-topic probability distribution. The parameters α and β are fixed values. β is a fixed value. Generally, α takes the value of 1 and β takes the value of 0.01, which can also be defined by the user. α can be interpreted as the frequency with which the topic is sampled before encountering the text, and β is the frequency with which the topic encounters the lexical corpus before encountering the lexical corpus of the word obtained from the sampling. z_{mn} denotes the topic for the n th word in the m th document; w_{mn} represents the n th word in the m th document, the all other variables such as document topic are implied.

$$\text{perplexity}(D) = \exp \left[- \frac{\sum \log(w)}{\sum_{d=1}^M Nd} \right] \quad (2)$$

$$p(w) = p(z/d) \times p(w/z) \quad (3)$$

where d represents a document, $p(w)$ denotes the probability of occurrence of each word, $p(z/d)$ represents the probability of occurrence of each topic in a document, and $p(w/z)$ represents the probability of occurrence of each word in the dictionary under a particular topic.

3.3 Collective action theory

Collective action theory focuses on how individuals overcome the “free-rider” dilemma to achieve collective goals. Traditional theories emphasize that the characteristics of public goods lead rational individuals to be unwilling to bear the costs of participation. Olson (1965) therefore proposed relying on organizations to use coercion and selective incentives—a combination of rewards and punishments—to solve the problem. In the Web 2.0 era, the theory of digitally connected action (Bennett & Segerberg, 2013) has brought a new perspective. This theory points out that based on shared personalized

narratives, weak connection networks built with the help of social media platforms can facilitate large-scale, decentralized collective action without relying on a strong organizational structure. In the “Night Riding to Kaifeng” incident, the two platforms Weibo and Zhihu became the core venues for such connected action and discussion. Numerous college students shared their night cycling experiences and feelings on Weibo, posting beautifully crafted short videos. These personalized narratives resonated with a large audience, inspiring more people to join the night cycling movement. Meanwhile, discussions on Zhihu about night cycling deepened, evolving from initial cycling guides to explorations of the underlying social significance of the night cycling phenomenon, further driving the development of collective action.

3.4 Urban social movement theory

Urban social movement theory focuses on social conflicts and collective demands surrounding the production, use rights, and distribution of public services (such as transportation and cultural facilities) in urban spaces (Castells, 1983; Harvey, 2008, 2012). The core of such movements often involves opposing spatial planning and usage rules dominated by capital or administrative forces, striving for more inclusive, fair, and culturally responsive urban spaces that meet community needs. In the “Night Riding to Kaifeng” incident, the youth group’s non-commuter-style, large-scale occupation of Zhengkai Avenue, their “competition” for shared bicycle resources, their demands for free admission to scenic spots, and their dissatisfaction with restrictions on their activities essentially reflected a challenge and negotiation of the established rules for the use of urban space and the logic of public resource allocation. It was a manifestation of the struggle for the right to use urban space and the right to cultural expression for a specific group (young students).

3.5 Hybrid space theory

The hybrid space theory was systematically proposed by de Souza e Silva (2006), which profoundly explains how mobile digital technologies (such as smartphones) can break down the traditional boundaries between physical and digital spaces through real-time data overlay and interaction, giving rise to a new type of social space field in which the two are deeply intertwined and mutually shaped. Its core lies in revealing that the physical layer and digital layer are not mutually exclusive but are continuously co-constructed through user practice. “Night Riding to Kaifeng” is far from a simple offline incident or online topic. It is essentially a collective practice and negotiation by young people, relying on mobile technology, in a mixed space field jointly constituted by Zhengkai Avenue (physical space) and the Weibo and Zhihu

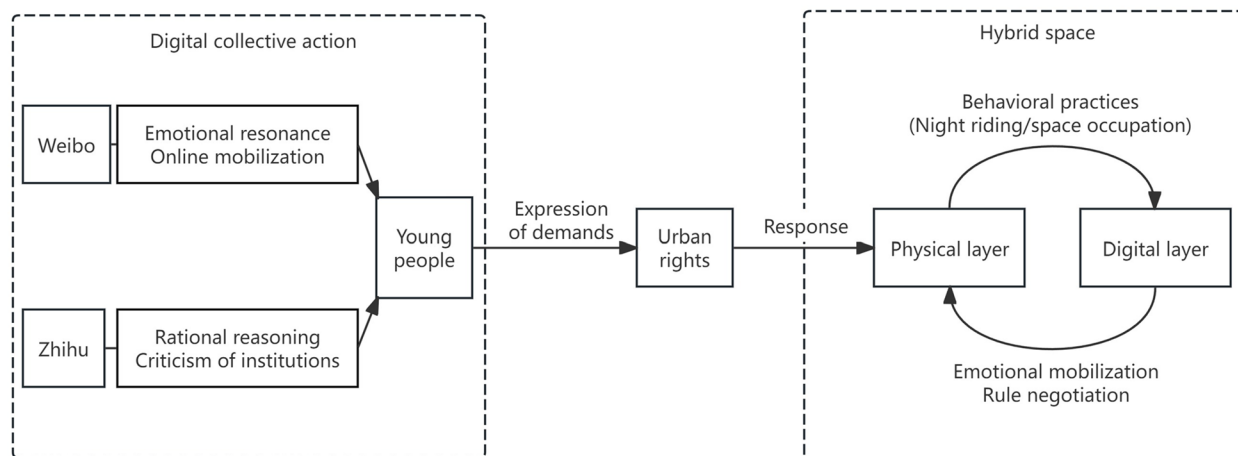


Fig. 1 Interactive relationship framework

platforms (digital space), regarding the right to use urban space, the right of young people to express their culture, and existing governance rules.

Based on Hybrid Space Theory, Collective Action Theory, and Urban Social Movement Theory, this study proposes the following interactive relationship framework (Fig. 1):

This framework reveals the co-construction mechanism between the physical layer (urban physical space) and the digital layer (social media platforms) in hybrid spaces, as well as the evolutionary path of youth digital collective action under the synergistic effects of emotional resonance (Weibo) and rational speculation (Zhihu).

4 Research design

4.1 Case review

The “Night Ride to Kaifeng” incident began on June 18, 2024, when four female college students from Zhengzhou decided to ride shared bicycles from Zhengzhou to Kaifeng to taste Kaifeng’s soup dumplings. They departed at 7:00 p.m. and arrived in Kaifeng after more than three hours. This act was recorded and posted on the internet but did not immediately gain attention. It wasn’t until early November 2024 that some college students began to imitate the act, spreading the news and stimulating the interest and enthusiasm of more students. This led to a large number of students competing to ride at night, sparking the “Night Riding to Kaifeng” craze. On the night of November 8, 2024, the activity reached its peak, causing traffic congestion and posing significant safety risks. Subsequently, bike-sharing platforms, local governments, and traffic control authorities took measures to guide and regulate the activity, effectively putting the “Night Riding to Kaifeng” craze on pause.

4.2 Data sources

Weibo has a monthly active user base of 587 million, making it a social media platform with massive traffic where the public can freely express their personal views. Zhihu is currently the largest high-quality Chinese-language online Q&A community and original content platform for creators in China (Zhang et al., 2024), with an average of 81.1 million monthly active users. Selecting Weibo and Zhihu as data source platforms can comprehensively reflect the public’s views on the night cycling incident in Kaifeng, providing reference for public opinion governance work.

Using “Night Riding to Kaifeng”, “Night Ride”, “Night Ride Journey”, “Cycling Army”, “Zhengzhou-Kaifeng Expressway” as the keyword, we wrote a Python program to capture the corpus text related to Weibo and Zhihu. After data deduplication and cleaning, we obtained a total of 27,216 valid texts, of which 20,918 from the Weibo platform and 6,298 came from the Zhihu platform. The statistics of the number of responses in each period are shown in Figs. 2 and 3, respectively:

4.3 Research framework

This paper takes the Weibo and Zhihu platforms as the research platforms, sets the search keyword “Night Riding to Kaifeng”, and the data acquisition period from October 25, 2024, to November 26, 2024. A crawler program was written to capture the relevant text information as research samples, obtaining 20,918 items from the Weibo platform and 6,298 from the Zhihu platform, totaling 27,216 items. The research framework is as follows:

- Divide the public opinion cycle according to the life cycle theory and the characteristics of the event

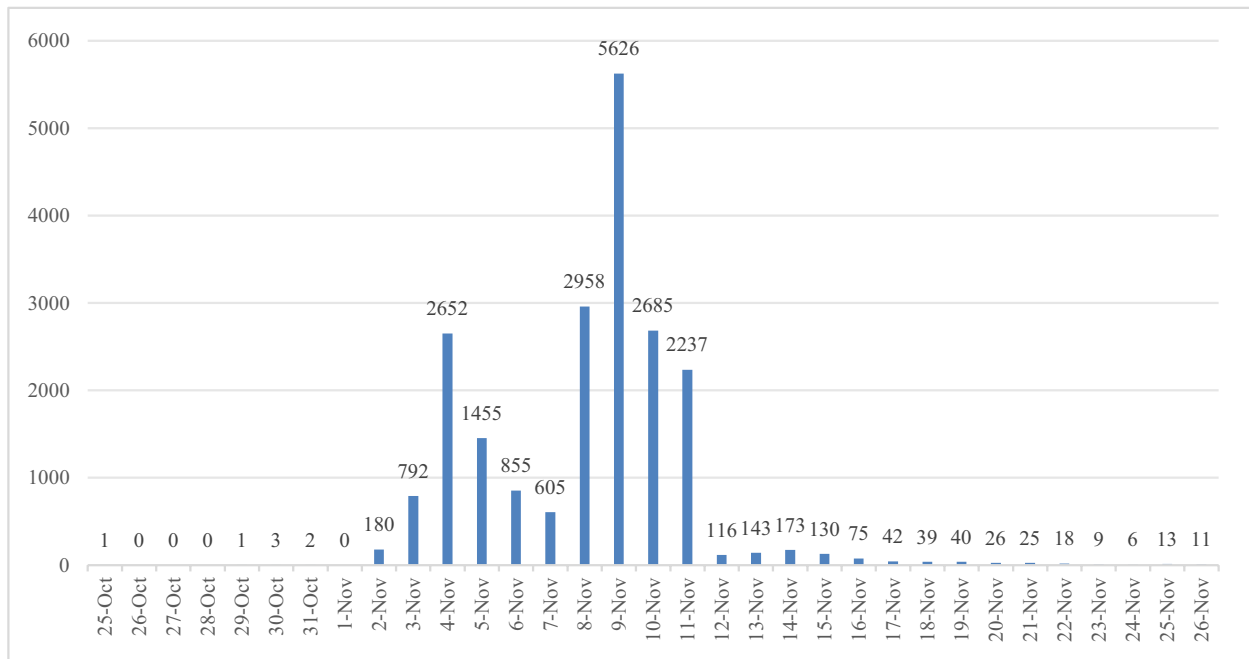


Fig. 2 Statistics of the number of texts on the Weibo platform

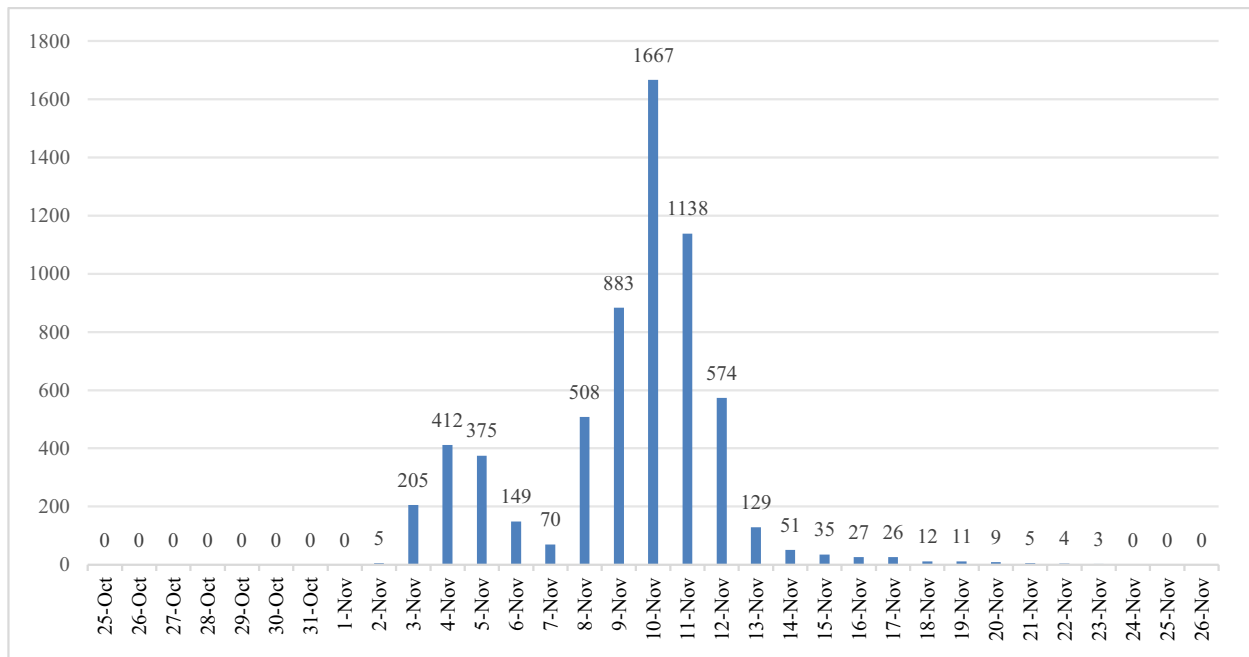


Fig. 3 Statistics of the number of texts on the Zhihu platform

itself, classifying the public opinion into four stages: latent period, accelerated period, mature period, and decline period.

- Based on different platforms, analyze the text of each stage using the emotion dictionary to identify

the trend of public emotion and analyze the causes of emotion based hybrid space theory.

- Based on different platforms, use the LDA topic model to conduct theme modeling of the text of each stage, and analyze the public opinion performance of

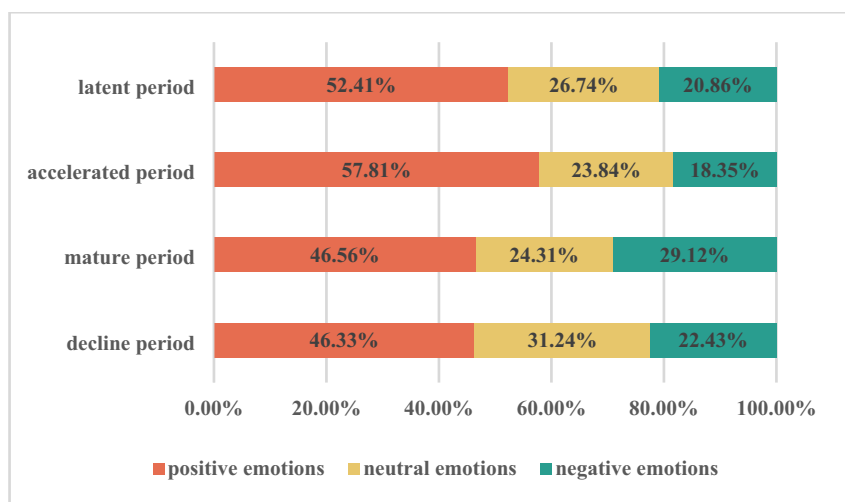


Fig. 4 Emotional changes (Weibo)

the two major platforms using collective action theory and urban social movement theory.

- Finally, based on the perspective of hybrid space, summarize the characteristics of public opinion and put forward suggestions for public opinion control.

5 Empirical analysis

5.1 Division of public opinion cycle

According to the changes in the number of texts and the characteristics of the incident itself, the life cycle of public opinion on the “Night Riding to Kaifeng” incident was divided into four phases: Latent period (October 25 to November 2), with 192 texts. During this stage, the average daily number of posts was less than 200 (combined total for Weibo and Zhihu platforms), the topic did not enter the trending search rankings, and its dissemination was limited to localized communities, exhibiting characteristics of low attention and weak diffusion.

Accelerated period (November 3 to November 7), with 7,570 texts. During this period, the number of posts grew exponentially, with the topic reaching the top of Weibo’s trending list on November 4 and achieving a cross-platform diffusion index of 3.8, marking an explosive spread of public attention from a localized to a widespread level.

Mature period (November 8 to November 12) with 18,392 texts. Public opinion reached its peak, with a surge in related topics driving the depth and breadth of discussion to an all-time high. Sentiment on social media became significantly polarized, with discussion reaching its peak.

Decline period (November 13 to November 26) with 1,062 texts. During this period, the number of posts showed a continuous decline, and no new topics

emerged. Public attention shifted, and public opinion gradually dissipated.

5.2 Emotion analysis

GooSeeker is a data analysis software with powerful emotion analysis functions. GooSeeker organizes the commonly used emotion lexicon and accumulates a large number of feature words with emotional tendencies. The emotion lexicon of GooSeeker is easier to supplement. In this study, after organizing and labeling the emotion words in the dataset, we constructed the emotion lexicon of mass emergencies online public opinion and imported it into GooSeeker’s emotion lexicon. Compared with other emotion dictionaries, GooSeeker’s analysis of emotion is more accurate.

In this paper, we use GooSeeker to process the dataset by segmentation and calculate the weights of each feature item for emotion tendency analysis using each table in the emotion dictionary. Based on this, this paper imports the text information corresponding to different periods (latent period, accelerated period, mature period, and decline period) of the two platforms into the model for sentiment analysis, organizes the output results, and calculates the number of positive, neutral, and negative sentiment texts in each stage of public opinion, as well as their respective proportions, as shown in Figs. 4 and 5:

Weibo platform: During the latent and accelerated periods, the positive emotional resonance on Weibo was essentially the result of users emotionally encoding and sharing their offline cycling experiences (the novelty and sense of freedom of physical space) in digital space. This shared narrative greatly enhanced the appeal of offline participation and was the core emotional mechanism driving the expansion of the physical layer in the hybrid

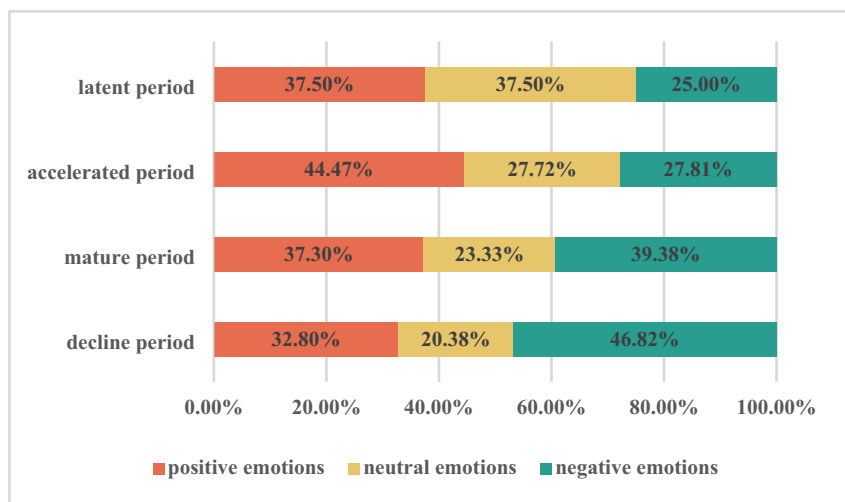


Fig. 5 Emotional changes (Zhihu)

space. During the mature period, the negative consequences of offline space practices (cycling), such as litter and congestion, directly trigger an outburst of negative emotions when visualized through user-uploaded content on the Weibo platform. This leads to positive emotions still dominating but beginning to diverge toward neutral or negative sentiments. During the decline period, topic attention decreases, but due to the social memories from early check-in-style participation, nostalgic positive emotions persist in the digital layer.

Zhihu platform: During the latent and accelerated periods, Zhihu’s relatively balanced and divergent emotions reflected its users’ tendency to examine the potential tensions between online narratives and offline behaviors (such as safety, management, and responsibility) from a hybrid space perspective in the early stages of the incident, rather than simply emotional resonance. In the mature period, negative emotions exceeded positive emotions for the first time, with the core driving factor being Zhihu users’ in-depth rational criticism of offline space conflicts (the impact of cycling activities on urban order and public resources) and their online reflections (negative material on Weibo). This critical emotion was a direct response to the intensification of contradictions between the physical and digital layers in the hybrid space, and focused on exploring the institutional roots behind the conflict (urban governance and spatial justice). In the decline period, negative emotions still accounted for a high proportion, reflecting Zhihu users’ critical reflection on the ultimate outcome of the incident and their continuing concern about the deep-rooted problems exposed by the incident.

The positive emotions and emotional resonance on the Weibo platform were the key emotional links that

amplified and drove the physical layer (offline participation) in the hybrid space. Users expressed their emotions through phrases like “Youth is all about going wild” and “Check in at the city’s romantic spots”, not only sharing personal experiences but also collectively building emotional resonance, forming a powerful online mobilization force. This effectively overcame the organizational barriers of traditional collective action, driving explosive growth in offline actions, and demonstrated the core mechanism of decentralized collective mobilization in the digital age. The emotional dispersion and rational speculation on the Zhihu platform is a deep examination of spatial rights and governance rules after the outbreak of hybrid space conflicts (offline issues going online). Users’ in-depth debates on issues such as safety, management, responsibility, and cultural values are essentially using the perspective of urban social movements to rationally evaluate and construct a framework for the social costs, rule boundaries, and deeper meanings (such as the right to use public space and the right to cultural expression) of collective action. This speculation around spatial justice and mobility governance is a key link in whether collective action can gain broader social recognition and institutional response, and is also a deepening manifestation of connectivity action on knowledge community platforms. The two platforms together constitute a dual process of emotional mobilization (Weibo) and rational sedimentation (Zhihu) in hybrid space.

5.3 Thematic analysis

5.3.1 Determining the number of topic

Since the development of the LDA topic model, its applications have become increasingly widespread, with diverse extensions emerging. LDAvis is one such

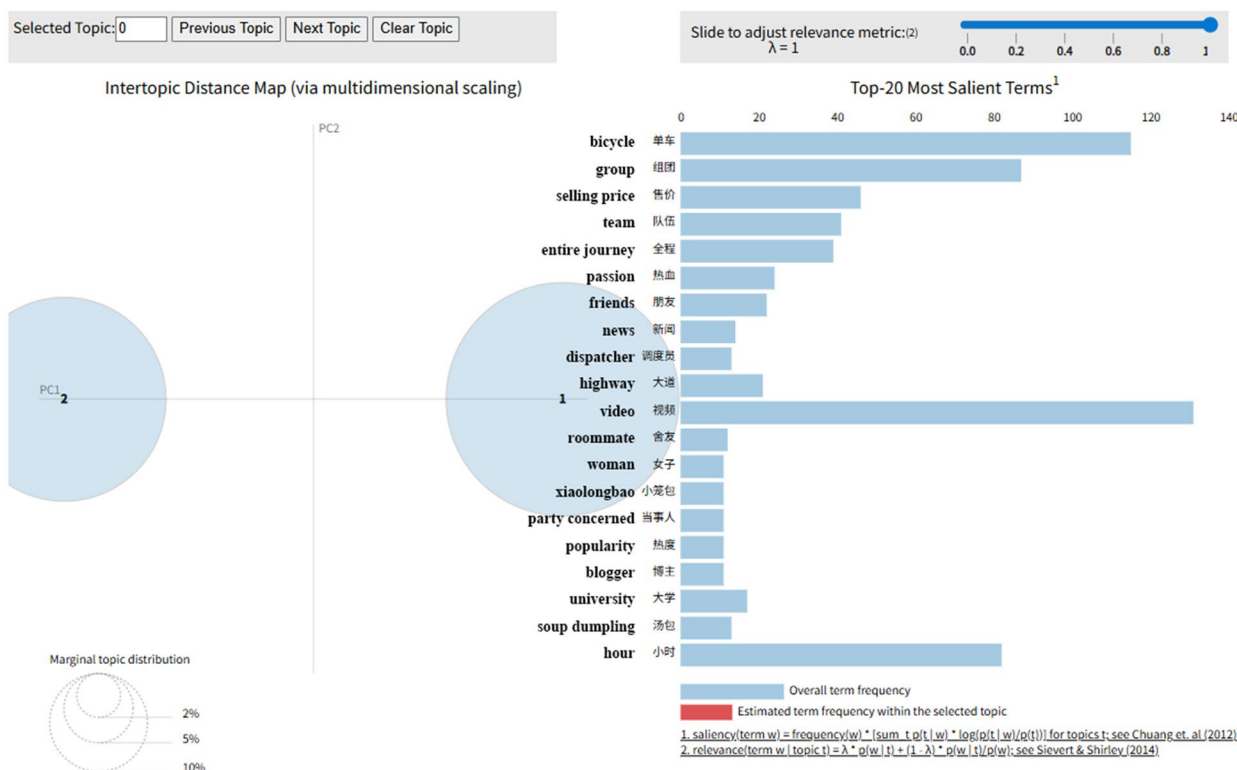


Fig. 6 LDAvis theme visualization diagram (Weibo - latent period)

extension of the LDA topic model. The LDAvis software package is an interactive tool designed for visualizing and refining LDA models, aiding in the visualization of topic relevance and making modeling results clearer and more intuitive. Perplexity levels were calculated for each period (latent period, accelerated period, mature period, and decline period) across the Weibo and Zhihu platforms. Using the pyLDAvis package in Python, the generated visualization interfaces are shown in Figs. 6, 7, 8, 9, 10, 11, 12 and 13:

LDAvis represents the frequency of topics using the size of circles, with higher frequencies corresponding to larger circles. The distance between circles indicates the appropriateness of topic classification, with larger distances indicating higher appropriateness and smaller distances indicating lower appropriateness. If two circles have a large overlapping area or if a larger circle completely encloses a smaller one, it indicates that the two topics are highly similar, and the topic classification is ineffective. If two circles have slight overlap or intersection, it suggests that some keywords of the two topics are slightly similar. If two circles have no overlap or intersection, it indicates that the two topics are highly independent, with good distinction accuracy, and the analysis results are relatively accurate. Based on this, we

can determine the optimal number of topics for each period on different platforms. The optimal number of topics for each period on the Weibo platform are 2, 5, 6, and 4, respectively; the optimal number of topics for each period on the Zhihu platform are 2, 5, 6, and 4, respectively.

5.3.2 Theme-word item

Based on the number of topics already determined in the previous section, the LDA model was trained on the research data using the Gensim package of the Python language, with the value of α set to 0.1 and the value of β set to 0.01. This process obtained the topic-phrase item distributions of the four phases on each platform. The potential topics in machine learning were contextualized, the topics were extracted, and meanings were assigned to each of the topics, as shown in Tables 1, 2, 3, 4, 5, 6, 7, and 8:

The trending topics on Weibo and Zhihu platforms during the latent period are shown in Tables 1 and 2, respectively. At this stage, offline physical space behavior (the practice of four girls night cycling and eating soup dumplings) was first presented in the digital space (Weibo) through short videos. The digital layer (online sharing) began to construct a narrative about this novel

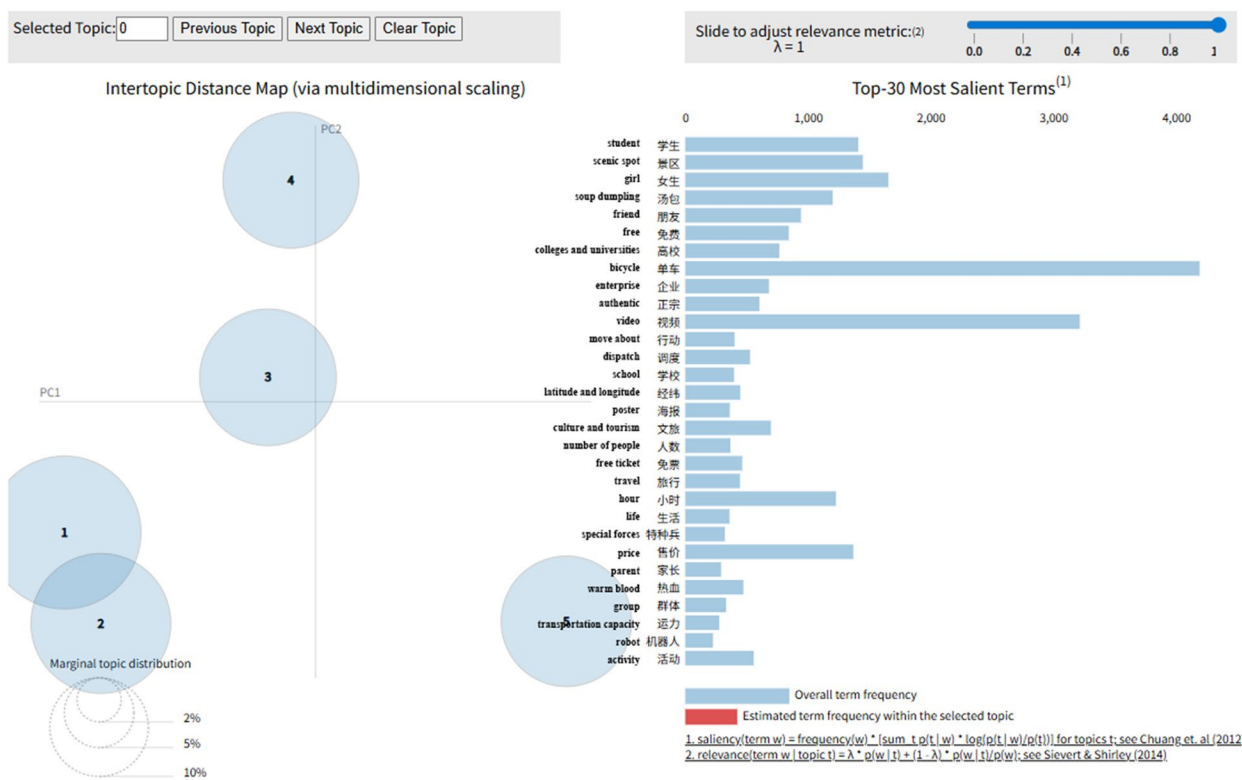


Fig. 7 LDAvis theme visualization diagram (Weibo - accelerated period)

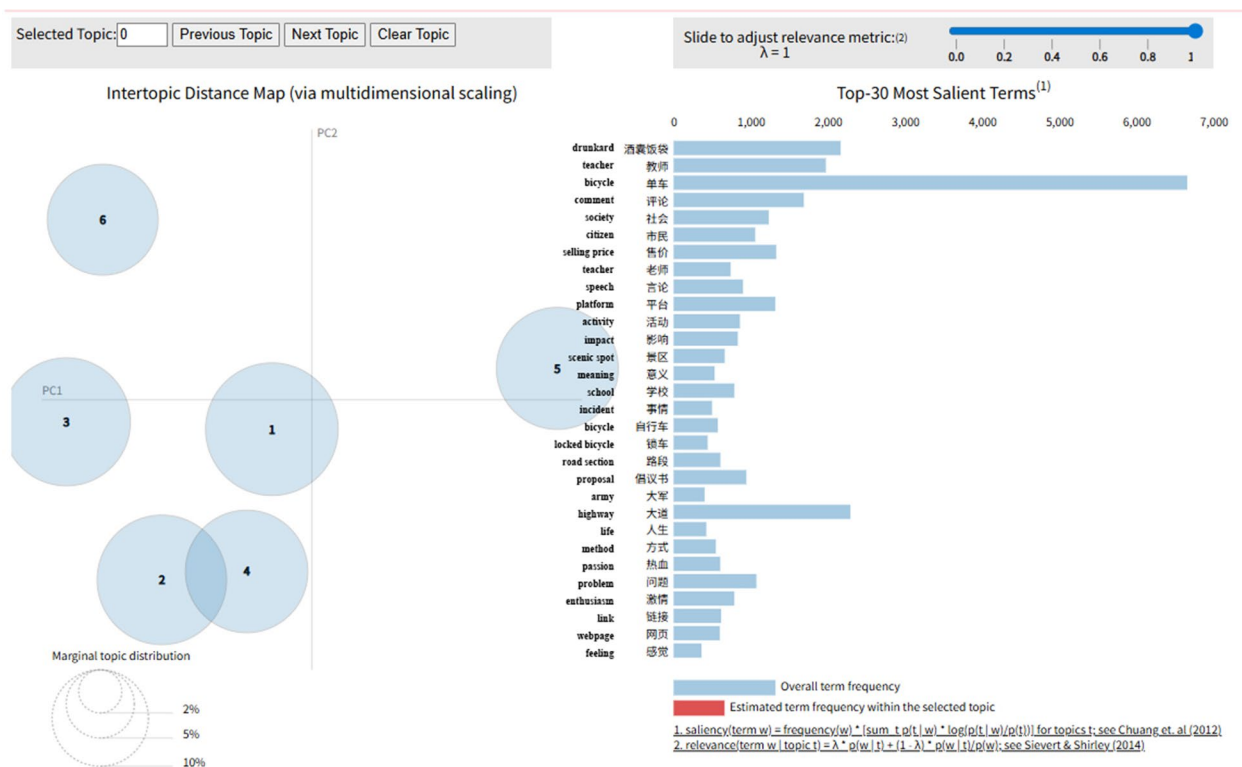


Fig. 8 LDAvis theme visualization diagram (Weibo - mature period)

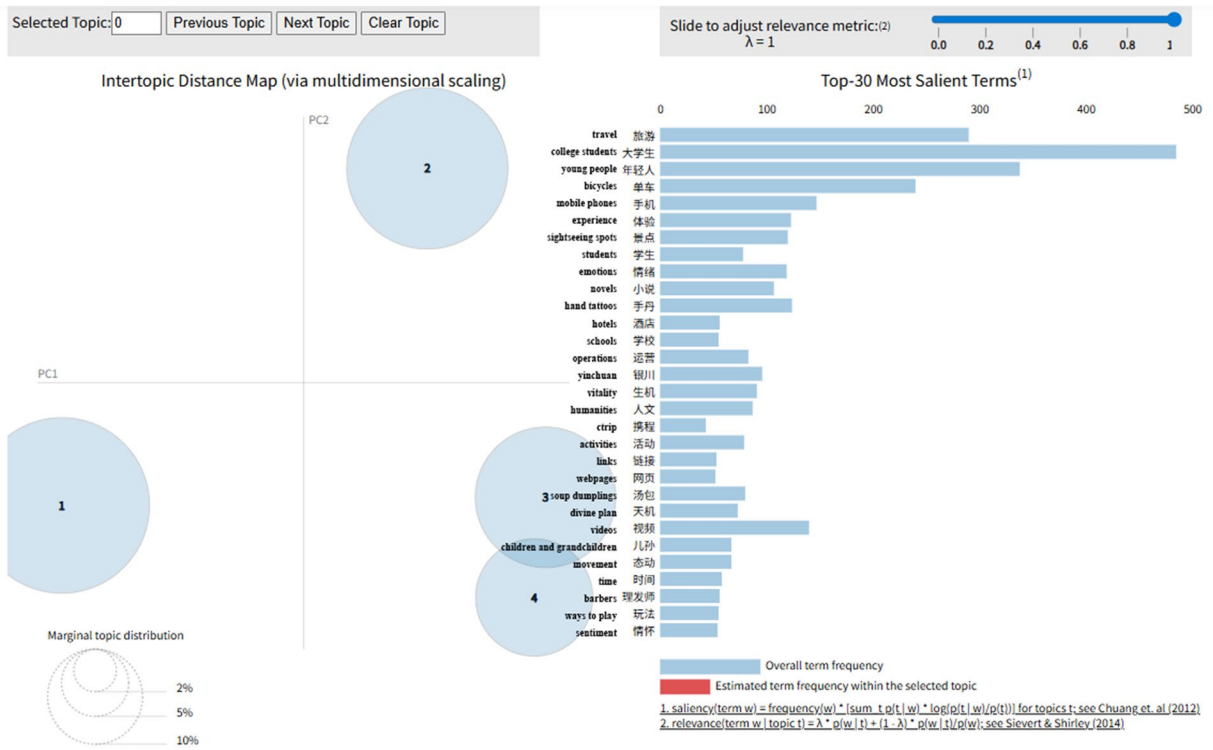


Fig. 9 LDAvis theme visualization diagram (Weibo - decline period)

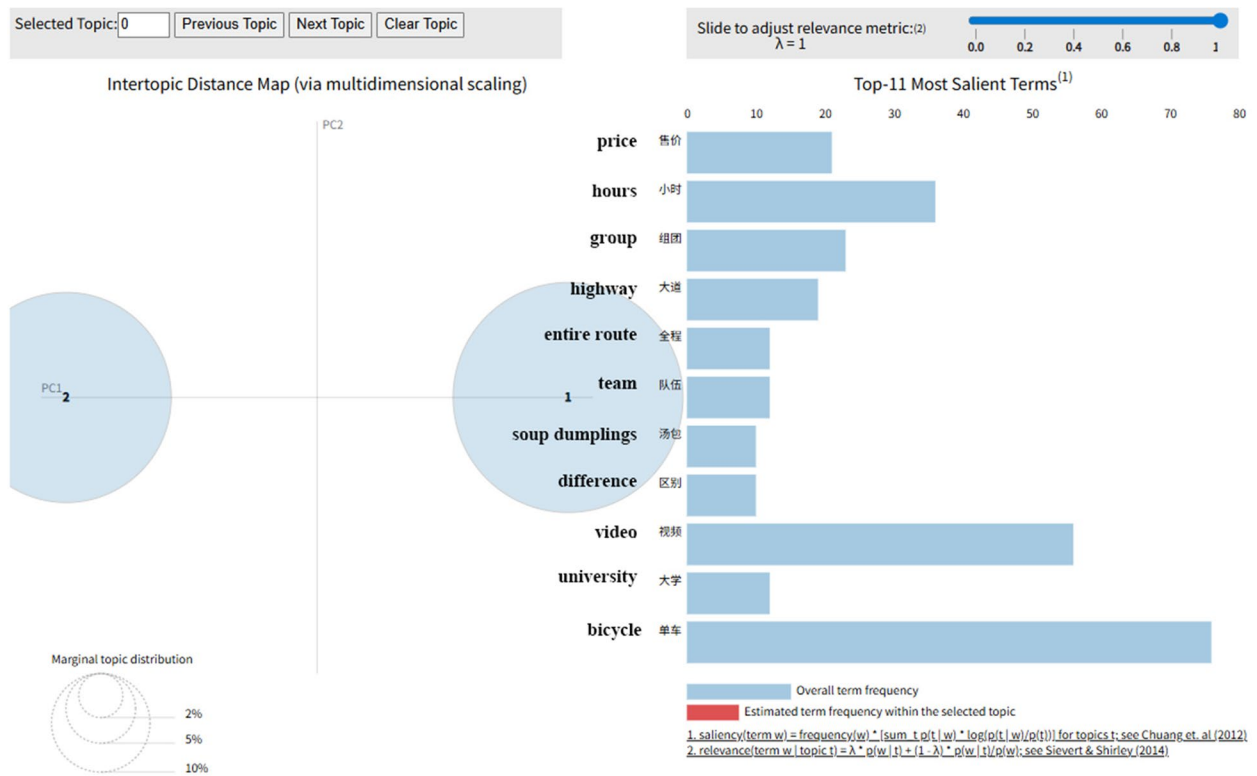


Fig. 10 LDAvis theme visualization diagram (Zhihu - latent period)

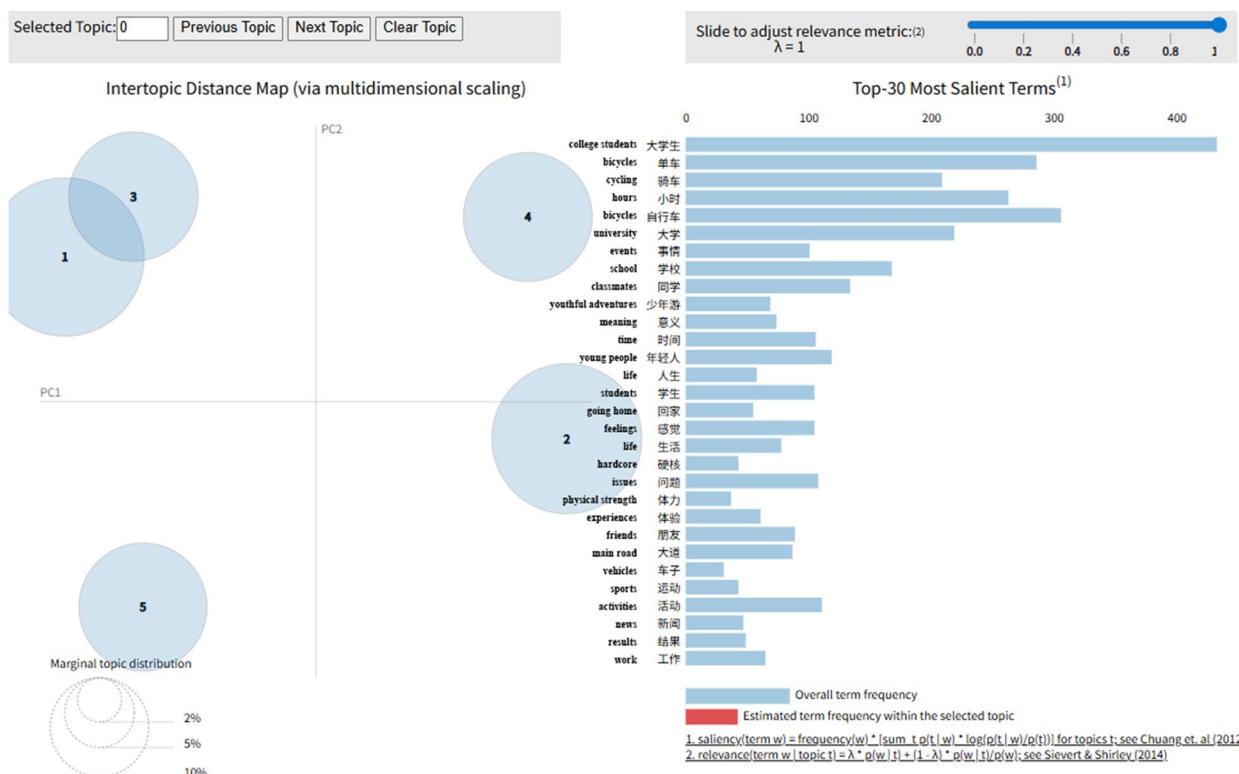


Fig. 11 LDAvis theme visualization diagram (Zhihu - accelerated period)

behavior, attracting a small amount of attention. During the latent period, public discussion of the “Night Riding to Kaifeng” incident focused mainly on two topics: riding bicycles to eat xiaolongbao and group night cycling. At this stage, the content discussed on Weibo and Zhihu was largely consistent, with the focus mainly on the incident itself.

The Weibo platform focused on diverse topics for discussion, covering bicycle management, college students cycling at night, ride a bike to eat soup dumplings, free admission to scenic spots, and news coverage. At this stage, college students formed groups to go night riding to Kaifeng, which continued to gain popularity and became a trend. Media reports significantly increased the popularity of the incident, forming a positive cycle of “reporting-participation”. Bike-sharing platforms responded quickly, optimizing vehicle dispatching and introducing riding discounts to reduce costs for students. Kaifeng Culture and Tourism also introduced preferential policies, with many major scenic spots opening free of charge to college students participating in night riding, which greatly facilitated students while also stimulating the local cultural and tourism economy.

Discussions on the Zhihu platform exhibit academic and in-depth characteristics, with primary discussion

topics including: college students riding at night, cycling distance, cycling safety, physical exertion, and life experience. Zhihu’s discussion on night cycling among college students is more diverse and in-depth: users focus on scientific cycling (discussing the optimal nighttime distance and long-distance planning strategies), safety risks (emphasizing the hazards posed by insufficient lighting and complex road conditions at night), and physical fitness management (coping with rapid energy depletion and recovery). Some users have even elevated the discussion to a philosophical level—night riding to Kaifeng has transcended a simple activity and become a cultural symbol representing youth, freedom, challenge, and exploration.

During the accelerated period, when the spread of the incident accelerated, public discussion of the “Night Riding to Kaifeng” incident showed significant thematic expansion, going beyond the focus on the incident itself. The two major social media platforms formed a stark contrast due to their differing media attributes: Weibo emphasized real-time dynamic sharing and emotional mobilization, with its topics primarily focusing on phenomenon descriptions and immediate interactions, serving as the engine connecting physical behavior with digital dissemination and driving scale expansion. While

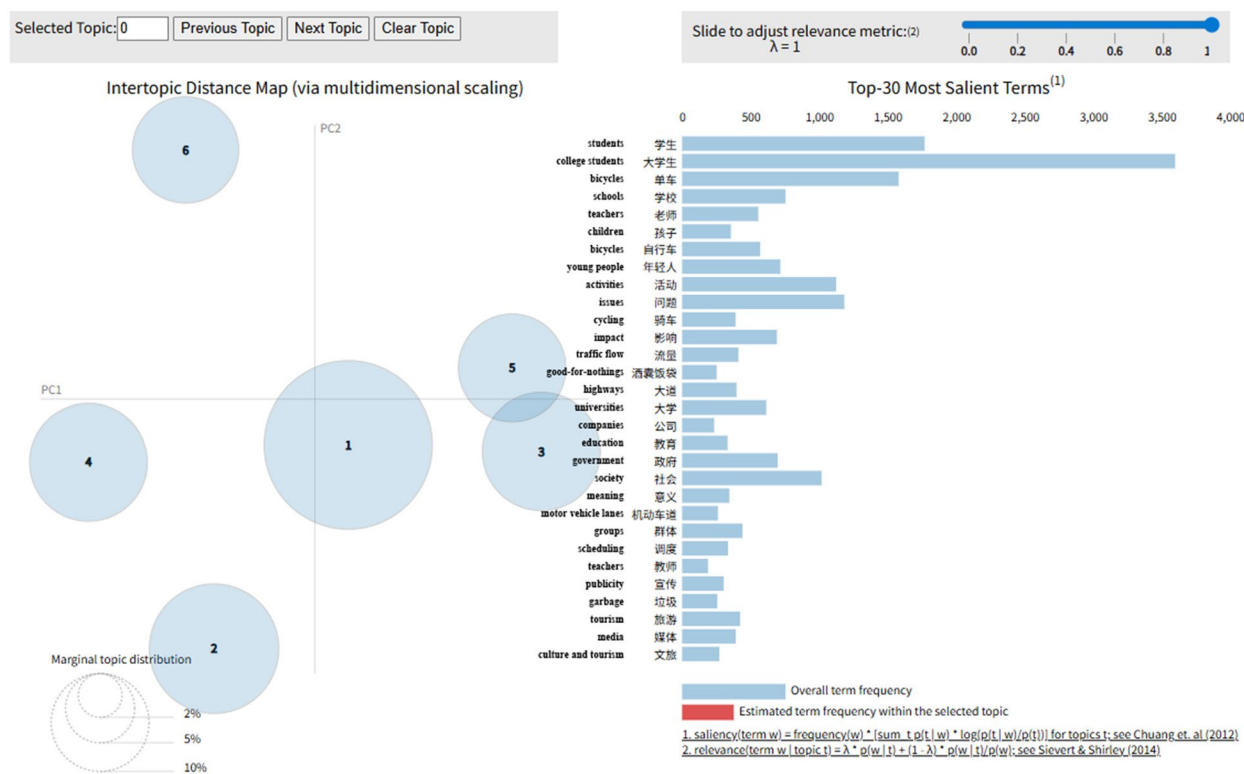


Fig. 12 LDAvis theme visualization diagram (Zhihu - mature period)

Zhihu highlighted in-depth analytical thinking, users systematically analyze the social issues derived from cycling and elevate them to the level of cultural value interpretation, constructing a framework of meaning for physical behavior at the digital level and issuing potential risk warnings, reflecting the initial form of rational sedimentation in hybrid space.

The themes of the latent period and accelerated period vividly illustrate the initial mobilization logic of connectivity actions in hybrid spaces. It originates from individualized, culturally symbol-driven physical-layer behaviors (the impulse to taste local cuisine), which rapidly construct shared narratives (youthful adventure, urban exploration) on the digital layer through social media (short video sharing, Weibo trending topics). This digital narrative triggers large-scale online attention and imitation intentions, which then translate into large-scale offline participation on the physical layer, forming a collective action explosion driven by weak connections. The construction and dissemination of narratives online (digital layer) is the core driving force behind the scale of offline (physical layer) actions. The two are closely intertwined and together shape the trajectory of the incident. This contrasts sharply with the organized structure emphasized by traditional resource mobilization

theory, highlighting the spontaneity and rapid aggregation of digitally native mobilization and its dependence on hybrid space.

The main discussion topics on the Weibo platform include: garbage everywhere, improper cycling leading to hospitalization, advocating rational cycling, forced locking of bicycles, free admission to scenic spots, and meaningful travel. During the mature period, local cultural and tourism departments continue to provide college students with preferential policies such as free tickets to enhance their travel experience. “Night Riding to Kaifeng” is a meaningful exploratory activity that is very popular among young people. However, the continued rise in popularity of the activity has also brought with it many problems: participants casually discarding trash has increased the burden on sanitation workers and damaged the city’s appearance; the health of individual blind followers has been damaged while riding, prompting public reflection on safety; and the illegal use of shared bicycles has caused dissatisfaction, prompting major platforms to jointly issue civilized initiatives and implement penalties.

The main discussion topics on the Zhihu platform include: the social impact of cycling, shared bicycle operation and management, the life experiences and spiritual

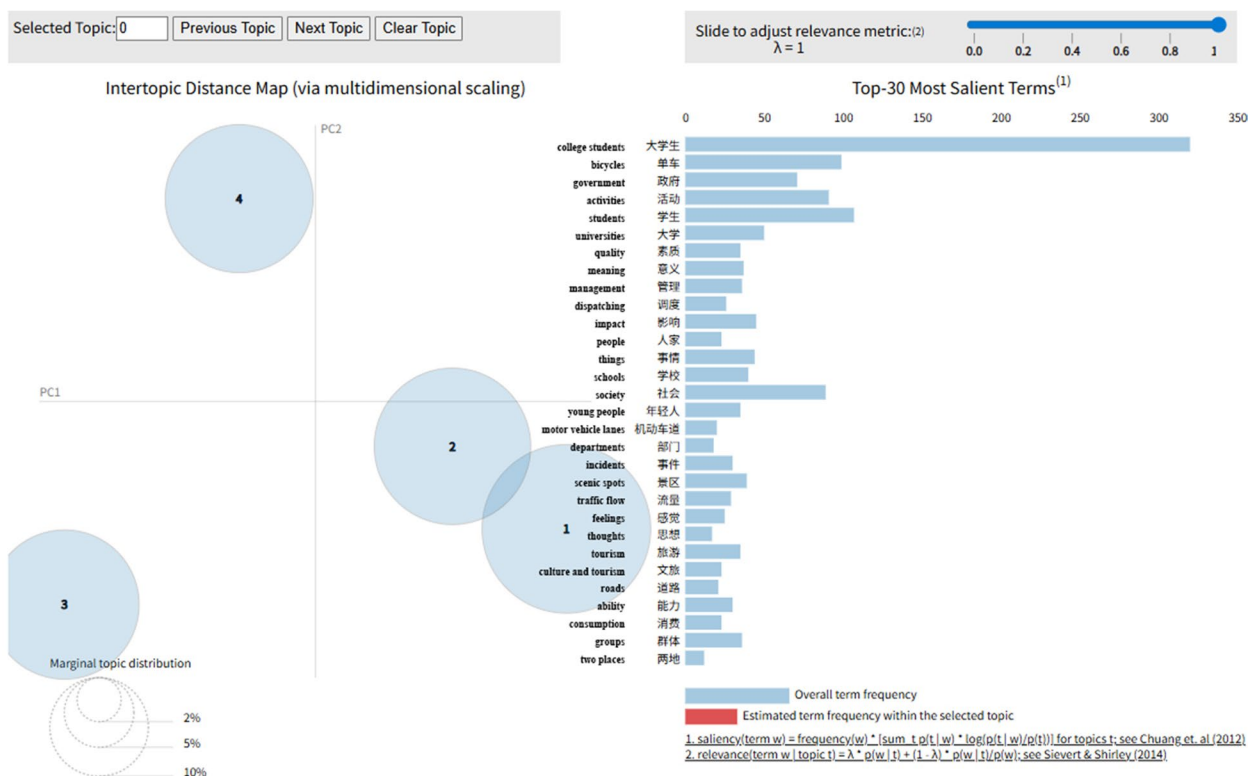


Fig. 13 LDAvis theme visualization diagram (Zhihu - decline period)

Table 1 Latent period theme—term distribution (Weibo Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	Night riding to eat soup dumplings attracts attention	bicycle, friends, news, roommates, xiaolongbao, parties involved, bloggers, popularity, soup dumplings, videos
Topic1	Group night riding	group, team, soup dumplings, bicycle, entire journey, passion, friends, university, roommates, xiaolongbao

Table 2 Latent period theme—term distribution (Zhihu Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	Group cycling	bicycle, group, highway, team, soup dumpling, difference, university, hour, woman, entire journey
Topic1	Ride a bike to eat xiaolongbao	soup dumplings, bicycles, xiaolongbao, the entire journey, university, group tour, team, highway, hours, travel

The public opinion topics on Weibo and Zhihu platforms during the accelerated period are shown in Tables 3 and 4, respectively

growth of young people, social evaluation and reflection in higher education, multi-party responsibility governance, and travel activities. During the mature period, Zhihu users’ discussions on “Night Riding to Kaifeng” delved into the level of urban governance (social impact, traffic pressure, bicycle management), exploring the conflict between college students’ behavior and public space management. From the perspective of youth subculture, they affirmed its social and exploratory value, while reflecting on the herd mentality and lack of risk awareness, and exploring the balance between passion and rationality. The discussion also extended to criticizing the absence of risk education and quality cultivation in colleges and universities, and analyzing the impact of education on guiding youth behavior. Some users emphasized that the incident was the result of a lack of responsibility on the part of multiple parties (government supervision, school education, corporate operations, and student self-discipline).

During this phase, the sustained rise in activity intensity was accompanied by numerous physical-layer issues, such as littering and the improper use of shared bicycles. These incidents were uploaded to Weibo (digitization of physical-layer issues), quickly becoming hot topics and generating a powerful negative public opinion

Table 3 Accelerated period theme—term distribution (Weibo Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	Bicycle management	bicycles, management, companies, vehicles, users, dispatching, services, fees, young people, scope
Topic1	College students cycling at night	students, universities, bicycles, schools, number of people, activities, staff, netizens, videos, news
Topic2	Ride a bike to eat soup dumplings	girls, soup dumplings, friends, authentic, action, travel, bicycles, groups, riding, cycling
Topic3	Free admission to scenic spots	Scenic area, free, cultural tourism, free admission, bicycle, special forces, Xinhua News Agency, night cycling, network traffic, tower
Topic4	News coverage	video, People's Daily, news, bicycle, passion, culture and tourism, enthusiasm, activities, tourists, vitality

Table 4 Accelerated period theme—term distribution (Zhihu Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	College students riding at night	bicycle, college student, university, activity, time, student, graduation, life, roommate, era
Topic1	Cycling distance	bicycle, cycling, location, distance, city center, public transportation, classmates, map, memory, school
Topic2	Cycling safety	college students, safety, experiences, challenges, young people, physical health, bicycles, culture, spirit, experiences
Topic3	Physical exertion	time, bicycle, location, physical strength, hotel, exercise, entire journey, energy, issues, bike
Topic4	Life experience	school, youth, meaning, young people, life, friends, experiences, university, time, living

During the lifecycle of public opinion development, the mature period is when the tension in the hybrid space reaches its peak. Tables 5 and 6 show the topics of public opinion on the Weibo platform and Zhihu platform, respectively

Table 5 Mature period theme—term distribution (Weibo Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	Garbage everywhere	citizens, highways, garbage, bicycles, road surfaces, night riding, traffic, impact, issues, teams
Topic1	Improper cycling leading to hospitalization	blindness, man, doctor, hospital, school, cycling, notification, hospitalization, heart, long distance
Topic2	Advocating rational cycling	bicycles, management, platform, proposal, risk, users, rationality, scheduling, transportation, pressure
Topic3	Forced locking of bicycles	bicycles, platforms, notices, locking bicycles, measures, areas, announcements, Qingju, vehicles, operations
Topic4	Free admission to scenic spots	scenic spots, cultural tourism, online traffic, enthusiasm, free, students, nationwide, tourism, tourists, soup dumplings
Topic5	Meaningful travel	passion, school, meaning, life, enthusiasm, life, university, bicycles, friends, young people

Table 6 Mature period theme—term distribution (Zhihu Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	The social impact of cycling	bicycles, garbage, daily life, disturbing the peace, impact, cycling, traffic, college students, motor vehicle lanes, civic awareness
Topic1	Shared bicycle operation and management	bicycles, dispatching, roads, regions, operations, services, vehicles, enterprises, order, platforms
Topic2	The life experiences and spiritual growth of young people	college students, young people, university, meaning, living, spirit, journey, passion, life, experience
Topic3	Social evaluation and reflection in higher education	teachers, society, students, education, universities, majors, exams, era, culture, world
Topic4	Multi-party responsibility governance	Students, schools, issues, government, responsibility, management, incidents, circumstances, activities, society
Topic5	Travel activities	college students, online traffic, tourism, media, publicity, scenic spots, cultural tourism, bicycles, official, free

The public opinion topics on the Weibo platform and Zhihu platform during the decline period are shown in Tables 7 and 8, respectively

Table 7 Decline period theme—term distribution (Weibo Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	The lifestyle of young people	mobile phones, locusts passing through, lying flat, reality, standards, young people, parents, ideas, culture, dinner parties
Topic1	Meaningful travel	college students, bicycles, activities, online traffic, passion, society, enthusiasm, life, media, tourists
Topic2	School lockdown management	college students, schools, campus closures, teachers, activities, staff, scheduling, regions, travel, significance
Topic3	Travel experience	young people, travel, experiences, attractions, emotions, bicycles, soup dumplings, college students, culture, ways to enjoy

Table 8 Decline period theme—term distribution (Zhihu Platform)

Topic	Theme logo	Lexical items (partial)
Topic0	The impact of cycling activities	bicycles, students, quality, scheduling, impact, motor vehicle lanes, traffic, online traffic, roads, garbage
Topic1	The essence of college student travel	college students, universities, essence, management, tourism, society, cultural tourism, scenic spots, internet, publicity
Topic2	The social impact of travel	college students, scenic spots, groups, consumption, ideas, time, media, tourism, young people, activities
Topic3	The pressure of survival for young people	government, society, young people, groups, pressure, economy, order, resources, capabilities, development

landscape in the digital realm. This digital-layer pressure directly prompted major platforms to jointly issue civilized behavior initiatives and implement penalties. Local governments and schools also accelerated decision-making, prompting the physical layer to respond to the digital-layer public opinion. In addition, at this stage, the in-depth discussion on Zhihu was not isolated from the physical layer, but rather a rational deconstruction of the physical layer conflict and the phenomena it triggered on the digital layer. This represented the “knowledge layer” effort to seek explanations for the conflict and potential solutions in the hybrid space, attempting to steer the emotional physical-digital conflict toward a rational governance discussion.

The public opinion discussion during the mature period profoundly revealed the direct conflict between “Night Riding to Kaifeng” as a digital collective action and the urban governance structure. The emergence of negative topics such as “garbage everywhere” and “forced vehicle locks” on the Weibo platform, along with the intense discussions they sparked, signify a sharp contradiction between young people’s spontaneous spatial practices (such as non-commuting occupation of the Zhengkai Avenue) and existing urban spatial usage rules and governance logic. Essentially, this represents a symbolic challenge and “reclamation” of public space usage rights by young people, while also exposing the lag in existing governance models’ ability to address such new forms of mobile collective expression. Meanwhile, in-depth discussions on the Zhihu platform elevate specific

conflicts to the level of institutional reflection, systematically questioning structural contradictions such as the flexibility of urban policies, the absence of educational roles, and challenges to governance balance. This aligns with the core concerns of urban social movement theory—transforming discussions on spatial conflicts into a systematic examination of urban governance logic, fairness in resource allocation (spatial justice), and the urban rights claims of specific groups (youth). It reflects the rational maturation process of connected actions as they seek institutionalized solutions and social legitimacy.

The main discussion topics on the Weibo platform were: the lifestyle of young people, meaningful travel, school lockdown management, and travel experience. To alleviate traffic congestion caused by the night riding craze, many schools issued notices restricting student participation, sparking widespread discussion. Some believe that night riding to Kaifeng is a beneficial life experience, but others worry that young people’s addiction to mobile phones and the prevalence of a culture of complacency will weaken their motivation to socialize and strive in real life.

The main discussion topics on the Zhihu platform include: the impact of cycling activities, the essence of college student travel, the social impact of travel, and the pressure of survival for young people. The impact of cycling activities focuses on bicycles and students, extending to issues of urban traffic order and road resource allocation. Additionally, some perspectives are based on universities and the cultural tourism industry,

exploring the essence of college student tourism from the interaction of promotional strategies, online marketing, and young people's self-exploration needs. They also analyze the pressures faced by young people, rationally discussing social environmental factors such as economic order and development opportunities from macro dimensions such as government functions and social resource allocation.

At this stage, large-scale collective action at the physical level had been effectively suppressed, and the incident ended at the physical level, but the thoughts and discussions it sparked gained a longer life cycle and more far-reaching theoretical implications at the digital level. Weibo mainly focused on the direct consequences of physical intervention measures (closing the campus) and the state of youth reflected in the incident, while Zhihu continued its in-depth analysis, examining the long-term impact of the incident in a broader socio-economic context.

At this stage, the discussion in the digital space showed that the incident was a continuation of the struggle for urban space (the use of streets for night riding). Weibo's focus on the closure of the campus directly presented the control and response of urban authorities to spatial practices, while Zhihu's in-depth analysis elevated it to a more grandiose level of discourse, focusing on the survival pressures of urban youth, the justice of social resource distribution, and development opportunities, reflecting the key role of digital platforms in producing and disseminating discourses that challenge the existing urban political and economic structure. This multi-layered and deeply theoretical public discussion, which continued in the digital space after the physical action ended, clearly reflects an emerging form of digital native collective expression in the urban context. Although it is rooted in physical events, its thematic extensibility, theoretical depth, and platform-driven differentiated expression ecosystem constitute a unique digital vitality that distinguishes it from traditional offline movements.

6 Characteristics of public opinion evolution from the perspective of hybrid space

6.1 Temporality: the life cycle of collective action in hybrid spaces and negotiating urban rights

The life cycle of "incident exposure—diffusion and fermentation—intensification of contradictions—rational precipitation" not only reflects changes in the popularity of information, but also deeply maps the internal logic of digital collective action in hybrid spaces. During the latent and accelerated periods, individual behavior (physical layer) constructs a shared narrative through short videos (digital layer), triggering emotional resonance and imitation in the digital space, which drives

large-scale offline (physical layer) participation. This is a weak-tie-driven, decentralized mobilization that is significantly different from traditional resource mobilization. In the mature period, large-scale offline practices challenge established spatial rules and resource allocation logic (physical layer conflict), and conflict scenes are uploaded to the digital space, forming a powerful negative public opinion field (digital layer pressure). This reflects the symbolic struggle of specific groups for "urban rights" (the right to use public space) and cultural expression rights. The in-depth discussions on Zhihu serve as a rational framework for constructing this conflict, exploring its underlying institutional roots (spatial justice, mobility governance). During the decline phase, physical-layer actions are suppressed, but discussions in the digital layer (especially on Zhihu) shift toward deeper reflections on urban governance, aiming to provide a knowledge foundation for future rule negotiations or policy adjustments. This is a deepening manifestation of connectivity action in the knowledge community. This temporality is not only a change in public opinion, but also a complete life cycle of spontaneous collective action driven by digital connectivity and centered on urban space rights in a hybrid space, from emotional mobilization and spatial practice conflicts to rational reflection and potential institutional consultation.

6.2 Platform differentiation: functional differentiation and synergistic effects in hybrid spaces

Within the framework of hybrid space theory, the physical layer and digital layer are continuously constructed in a bidirectional manner through user practices. Weibo serves as an "emotional resonance field" and a "physical-digital connection engine", with its core function being to efficiently achieve the emotional encoding, instant dissemination, and mass mobilization of physical space practices in the digital space. By sharing emotional narratives, users quickly construct shared emotions (mostly positive) in the digital layer, forming a powerful emotional resonance that effectively overcomes the organizational barriers of traditional collective action, drives explosive growth in offline participation, and provides real-time visual feedback of physical layer conflicts to the digital layer, becoming the core driving layer of connection, mobilization, and conflict presentation in hybrid space. Zhihu is positioned as a "field of reflection", and its users are more inclined to deeply deconstruct the tensions in hybrid spaces: focusing on analyzing the institutional roots of physical layer conflicts, evaluating the rationality of the digital layer narrative framework, and systematically discussing the challenges and insights of incidents on urban governance rules, spatial rights claims, and spatial justice from the perspective of

urban social movement theory. Zhihu's rational speculation aims to seek explanatory frameworks and potential solutions for hybrid space conflicts, playing a key role in knowledge production and meaning negotiation.

This functional differentiation is essentially a natural division of labor between different digital platform layers in hybrid space: Weibo focuses on connecting, mobilizing, and presenting physical layer practices and their immediate conflicts; Zhihu focuses on deconstructing conflicts, constructing meaning, and exploring rule negotiation and rights claims in hybrid space. The two are not separate, but form a powerful synergy.

6.3 Ease of guidance: governance intervention points in hybrid spaces

The explosive spread and widespread participation in the "Night Riding to Kaifeng" incident vividly illustrates the significant "easily guided" characteristics of public behavior in hybrid spaces. As the incident unfolded, the government, authoritative media, and platform companies did not respond passively, but actively captured and utilized key signals transmitted through the digital layer in the hybrid space: the high level of positive sentiment on the Weibo platform, the widespread dissemination of participatory narratives, and the initial rational discussions and potential risk predictions on the Zhihu platform. These entities successfully influenced the scale, trajectory, and public perception of collective action by precisely intervening in the digital discourse layer (setting the agenda, disseminating positive information) and the physical rule layer (providing immediate incentives such as free tickets, adjusting space usage rules such as optimizing scheduling). The adoption of the Kaifeng model by surrounding cities (such as issuing "interprovincial cycling tickets") further demonstrates the diffusion effect of this guiding influence. It highlights that in hybrid space incidents, if the governing entities can effectively interpret and respond to real-time feedback from the digital layer (public opinion, emotions, issues), they can transform it into precise leverage for physical layer governance (space management, resource allocation, behavioral norms), thereby seeking a dynamic balance between maintaining urban vitality and order.

6.4 Negative emotion contagion: conflict amplifiers in hybrid space

The development of the "Night Riding to Kaifeng" incident clearly shows the strong contagiousness and rapid amplification effect of negative emotions in cyberspace, especially on mass communication platforms such as Weibo. This phenomenon is by no means a simple law of information dissemination, but rather the core driving force behind the escalation of conflicts under the tension

of hybrid spaces. When spatial conflicts in the physical layer and the resulting management measures are highly visualized through user uploads in the digital layer (especially on Weibo), the negative emotions they trigger become highly contagious. The inherent connectivity and algorithmic preferences of social media platforms enable these negative information and emotions, which carry specific spatial conflict scenarios, to rapidly aggregate, cross-infect, and spread exponentially in the digital layer. The rapid spread and amplification of these emotions play a key role as a "conflict amplifier" in hybrid spaces. Not only does it reinforce the group identity and intensity of dissatisfaction among victims and those affected at the physical level, but it also quickly coalesces in the digital space into widespread questioning of the legitimacy of offline practices (night cycling activities) and public opinion pressure. This powerful negative public opinion field in the digital layer directly accelerates the transition of public sentiment from the "spread and fermentation" stage to the "escalation of contradictions" stage, and ultimately strongly drives the introduction of more stringent governance intervention measures in the physical layer. Therefore, the contagiousness of negative emotions and their amplifying effect in hybrid spaces profoundly reveal how, in digital collective action, conflicts in the physical layer are perceived, reinforced, and transformed into governance pressure through emotional contagion in the digital layer, becoming a key catalyst for the escalation of contradictions and the acceleration of governance responses in hybrid space incidents.

7 Countermeasures and recommendations

7.1 Constructing a hierarchical hybrid space public opinion intelligence monitoring and early warning system

Given the stark differences in the functional positioning and public opinion characteristics of Weibo and Zhihu in hybrid spaces, it is necessary to build a hierarchical, accurate, data-driven intelligent monitoring and early warning system. The core of this system lies in setting differentiated monitoring targets, key indicators, and early warning thresholds based on platform characteristics to achieve early identification and accurate intervention in hybrid space tensions (conflicts caused by interactions between the physical and digital layers):

Weibo: Focus on capturing emotional resonance trends, signs of offline mobilization, and visual signals of conflict. Construct an emotion propagation heat map, integrate an emotion dictionary and machine learning, and track abnormal fluctuations in core emotional polarity (the ratio of positive to negative emotions) and the explosive spread of key negative emotion words in real time. Simultaneously deploy "phenomenon-level

behavior recognition algorithms” to monitor visual content (such as short videos and images) and topic tags that are strongly associated with specific offline actions and exhibit exponential growth. Set emotional polarity deviation thresholds from the baseline and negative keyword frequency thresholds, and coordinate with the platform’s hot topic algorithms to strategically increase the weight of official safety alerts and civilized initiatives in relevant information streams for proactive mitigation.

Zhihu: Use NLP technology (topic modeling, entity relationship extraction, etc.) to construct a semantic network model of topic evolution, continuously analyze the clustering strength, evolution path, and association density of core topics with theoretical concepts. Monitor the rise and fall of support for different viewpoints and the quality of arguments. Establish a “rational-negative emotion balance warning” under core topics. When negative emotions continue to exceed positive emotions and are accompanied by systematic questioning of the institutional roots, the system automatically prompts high risk, immediately activates an interdisciplinary expert response mechanism, organizes experts in urban governance, sociology, and other fields to publish in-depth analysis and participate in rational debates on platforms such as Zhihu, provides professional knowledge support, guides constructive discussions, hedges against waves of irrational criticism, and maintains a healthy ecosystem of knowledge in hybrid spaces.

7.2 Establish agile response and collaborative governance mechanisms based on hybrid space interaction

In response to new types of spontaneous collective actions, the core is to establish an agile response mechanism that enables real-time interaction between physical and digital spaces. This mechanism relies on seamless coordination between online early warning and offline predictive analysis to ensure that digital-layer monitoring signals are seamlessly integrated with the city command center, driving data-driven precise risk assessment and preemptive resource deployment. Implementation adopts a coordinated strategy of physical guidance and digital guidance: At the physical level, avoid harsh controls and implement flexible measures such as setting up temporary cycling lanes, strengthening security, sanitation, and medical forces, establishing flexible guidelines, and adjusting the dynamic operation zones of shared bicycles. The digital layer simultaneously and transparently publishes diversion plans and safety information, and differentiates the use of platform features—mass platforms focus on visual communication and emotional reassurance, while knowledge platforms focus on in-depth policy interpretation and governance concept explanation to address rational concerns. It is also essential to establish a

long-term positive incentive and rule-negotiation mechanism to proactively address the reasonable urban space rights demands of the youth demographic. For example, providing official support through insurance, discounts, or specific space usage rights for safe and orderly activities can promote a shift from confrontation to collaborative co-construction. This not only reflects respect for urban rights but is also a key institutional mechanism for conflict prevention and resilience-building. Through agile responses to hybrid space signals, coordinated online and offline actions, and understanding of the logic of collective action, this mechanism upgrades crisis management to opportunity governance, maintaining urban order while embracing and guiding digital vitality.

7.3 Strengthening urban resilience: integrating insights from hybrid spaces into long-term planning and youth policy

The fundamental principle of urban governance is to go beyond responding to individual incidents and enhance the systemic resilience to future incidents in hybrid spaces. This requires deeply integrating the patterns of hybrid spaces revealed by the “Night Riding to Kaifeng” case, especially the tension between young people’s spatial needs for exploration, socializing, and cultural expression and existing urban rules, as well as the hot spots, points of conflict, and youth demands mapped by public opinion data, into long-term urban planning and youth-friendly policy systems. At the urban space and transportation level, the spatio-temporal data derived from the incident should be systematically analyzed, and priority should be given to optimizing the nighttime slow-moving transportation system connecting university towns, cultural landmarks, and vibrant areas, comprehensively improving the carrying capacity and service quality of public spaces during key periods, and enabling infrastructure to be resilient to spontaneous, mobile, collective activities. More importantly, it is essential to acknowledge the legitimate needs of youth as a vital source of urban vitality and establish a systematic youth-friendly policy framework: significantly increase the supply of inclusive, high-quality nighttime and weekend public cultural and recreational services, provide safe, convenient, and affordable diverse transportation options, and aim to alleviate the pressure on youth caused by insufficient public services that leads to disorderly large-scale street occupations, transforming potential conflicts into urban vitality. At the same time, universities, communities, and digital platforms should be brought together to carry out responsible digital citizenship and urban practice education for young people, covering topics such as online behavior norms, risk awareness and legal boundaries in the use of urban

space, and the cultivation of awareness of the complexity of urban governance, empowering young people to become active partners in building resilient cities in the era of hybrid spaces. Only by institutionalizing insights into hybrid spaces can cities fundamentally enhance their adaptability and inclusiveness to spontaneous collective expression in the digital age and achieve a sustainable balance between vitality and order.

8 Concluding remarks

This study takes “Night Riding to Kaifeng”, a new type of youth digital collective action driven by social media and rooted in the physical space of the city, as a typical case study. It integrates data from Weibo and Zhihu platforms to reveal the cross-platform evolution patterns of public opinion on group emergencies. The study found that mass communication platforms (Weibo) generally present positive emotional resonance, efficiently connecting and mobilizing offline behavior, acting as an “emotional engine”. The knowledge community platform (Zhihu) has a more dispersed emotional distribution, with a strong rational and speculative tone, deeply analyzing the institutional roots and acting as a “field of reflection”. The evolution of public opinion themes shows a clear sequence of “incident exposure—diffusion and fermentation—intensification of contradictions—rational precipitation”, rapidly expanding from the incident itself to deeper issues such as safety management, urban governance, and youth culture. With hybrid space theory as its core framework, the study empirically reveals the essence of the deep interconnection between the physical layer (cycling on urban main roads) and the digital layer (social media discussions), as well as the synergistic effect of emotional mobilization and rational sedimentation on the two major platforms in the hybrid space. This not only deepens our understanding of the complexity of public opinion on group emergencies in the social media era, but also integrates collective action theory (digital connectivity), urban social movement theory (urban rights), and hybrid space theory to provide powerful tools for analyzing new types of youth action. It also reveals the “easily guided” nature of public behavior in hybrid spaces and the “contagious and amplifying” nature of negative emotions on Weibo, providing key insights for urban administrators to build a layered monitoring system, implement agile responses, and integrate youth space needs into the construction of resilient cities.

This study is mainly based on data from Zhihu and Weibo platforms and does not involve other social media platforms, so it may not fully capture the multimodal expression of public opinion in hybrid spaces. The case study focuses on the “Night Riding to Kaifeng” incident driven by a specific youth subculture, and the universality

of its public opinion evolution characteristics for other types of group emergencies needs to be further verified. Future research can expand data sources, integrate data from more social media platforms, comprehensively capture the public opinion patterns of hybrid spaces, explore the deep integration of public opinion analysis with technologies such as artificial intelligence and big data, and improve the intelligence level of public opinion analysis.

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Authors' contributions

Jijia Hao supervised; Xiaotong Dong wrote the original draft and supervised and did a formal analysis; Yingyue Li reviewed and edited. Shuang Li formal review. All authors read and approved the final manuscript.

Data availability

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This paper doesn't involve animal or human studies.

Competing interests

The authors declare that they have no competing interests.

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