



清华大学  
Tsinghua University

# Competing Narratives, Emotional Ripples:

Mapping BRI Global Sentiment Diffusion on Twitter with Large Language Models

吕蕙伊

外交学院人工智能社会科学研究系列讲座

2025年10月28日

## Self-Introduction

Research Interest:

- Substantive: Information Politics; Conflict Management; Southeast Asia
- Methodological: Text-as-data; Machine learning; LLMs; Spatial Analysis

BRI-related Research :

- *Competing Narratives, Emotional Ripples: Mapping BRI Global Sentiment Diffusion on Twitter with LLMs*
- How Border Anxiety in Official Discourse Impacts Public Sentiments? The Affective Geopolitics of BRI
- Provision of Infrastructure and Local Conflict: Project-Level Evidence from China's Belt and Road Initiative
- 流行性战略叙事缘何失效？基于大语言模型的“中国债务陷阱”叙事追踪



## Outline

- Research Motivation
- Literature Review
- Theoretical Framework
- Research Design
- Research Findings

## Research Motivation

Narrative competition as great power rivalry; IR's narrative turn



Achievement



Challenge



## Research Question

### The Belt and Road Initiative (BRI)

- grand strategy of China, from a Kazakh speech to a worldwide initiative, involving 153 countries as of 2023
- encompassing 50% of global GDP and 70% of the world's population as of 2020 (Garlick, 2020)
- Yet faces a stark 50-50 split in global public perception



### Belt and Road Initiative: Is China's trillion-dollar gamble worth it?

17 October 2023

Share Save

Tessa Wong

Asia Digital Reporter, BBC News

CT VIEWPOINTS

**Opinion: China's 'Belt and Road Initiative' is hurting us and other countries**

# Literature Review

## Strategic Narrative Theory

- states compete through narratives about international order, identity, and policy (Miskimmon et al., 2013)
- discourse as the low-cost and soft balancing tool to constrain rising powers (Pape, 2005; Paul, 2018)
- social media platforms as primary battleground for narrative competition (Page, 2018)

## Two Competing BRI Narratives

- win-win opportunity, catalyst for cul&tech exchanges and modernization (Haggai, 2016; Shah, 2016)
- debt trap, strategic threat and economic colonization (Van Noort and Colley, 2021; Rajah, Dayant and Pryke, 2019)

## How Existing Research Explains BRI Perception

- governmental responses → rational calculations based on geopolitical considerations (alignment, regional competition), economic interests (trade, development), domestic politics (regime type, elite preferences)
- public opinion → interdependent reactions to reality

# Theoretical Framework

## Sentiment Contagion in Strategic Narrative Competition

The puzzle with structural explanations:

- Economic interests + Geopolitics + Domestic institutions → Perceptions

Cannot explain:

- Why do countries' BRI sentiments shift almost simultaneously?
- Why are many countries' attitudes toward the BRI seemingly irrational and contradictory?
- Our answer:
  - Sentiment contagion over structural calculation
  - Major powers initiate sentiment signals → Transnational diffusion → Shape global consensus or polarization

## Theoretical Framework

### **Sentiment as Power:**

- Traditional power: military, economic, institutional
- Sentiment power: Capacity to shape others' emotional responses
- Low cost, high efficiency, hard to counter (Crawford, 2000; Mercer, 2014)

### **Sentiment Contagion Mechanism**

- Influence  $\neq$  Volume of messages
- Influence = Ability to make others “feel the same” and replicate emotions
- Social media amplifies contagion speed

### **Asymmetry in Sentiment Contagion**

- Not all actors have equal emotional influence
- Forms hierarchical “emotional leadership-followership” structure

## Research Design

### Option 1: Traditional Media

- Elite-focused, missing mass sentiment
- Slow publication cycles can't capture real-time contagion
- Limited cross-national comparison



The New York Times

### Option 2: Survey Data

- Prohibitively expensive for multi-country analysis, especially Global South
- Cannot trace moment-to-moment sentiment spread
- Response bias and potential manipulation



### Option 3: Social Media Data

- Real-time spontaneous expression across borders
- Network structure makes contagion traceable
- Massive scale: millions of organic, unfiltered opinions



## Research Design

### Use Twitter as data source

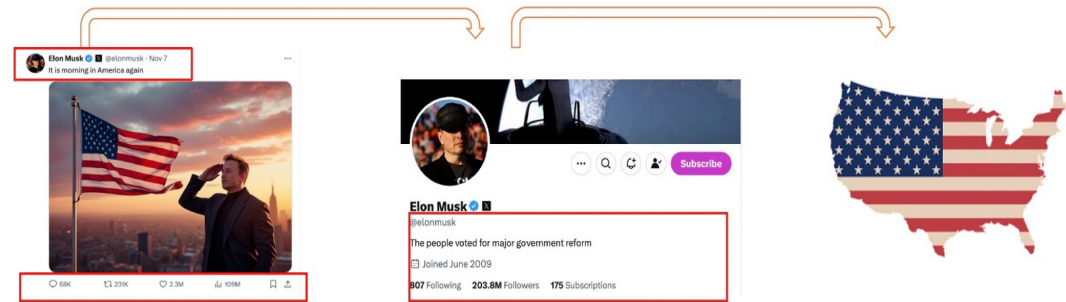
- open access, low cost
- wide coverage, free report
- real-time capture, fine-grained measurement

### However

- acknowledge demographic skew (urban, educated)
- noise and manipulation (e.g., bots, trolls)
- representativeness: findings interpreted as Twitter users' views rather than entire societies

### Nested Data Structure (as shown in the picture)

- analysis level: tweet; account; country

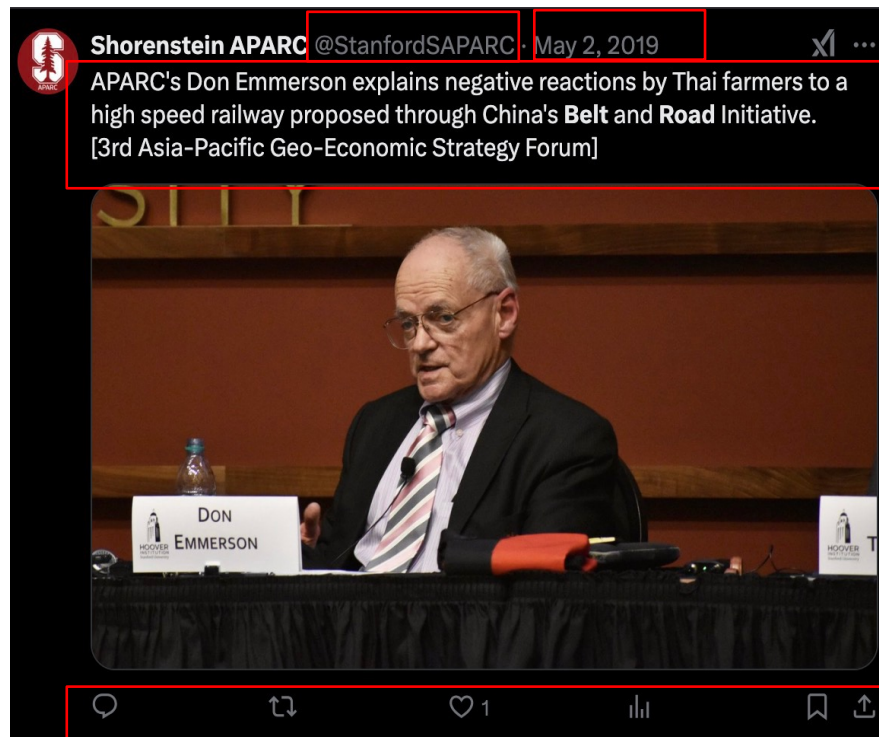


# Research Design

## Use Twitter API

- Search keywords: “the Belt and Road” “One Belt One Road” and “the New Silk Road” as well as common hashtags - #beltandroad, #obor, #bri, and #beltandroadinitiative
- Timeframe: 2013-2023
- Original English tweets (exclude retweets and replies)
- Final dataset: 251179 tweets from 63986 accounts
- Metadata: Timestamp; Username; User profile; Full text; Quantitative metrics (like, reply, retweet)
- Inferred Data:
  - Tweet Sentiment: Positive, Neutral; Negative
  - Tweet Topic: Politics, Economics, Culture&Tech, Social, Ecology, COVID-19, Comprehensive (multiple topics)
  - User Account Type: Official, Business, Media, Academic, Social organizations and social elites, Regular users
  - Geolocation at Country Level: 153 countries

## Research Design



Metadata:

- Timestamp
- Username
- Full text;
- Quantitative metrics (like, reply, retweet)

Inferred Data (using GPT-4o)

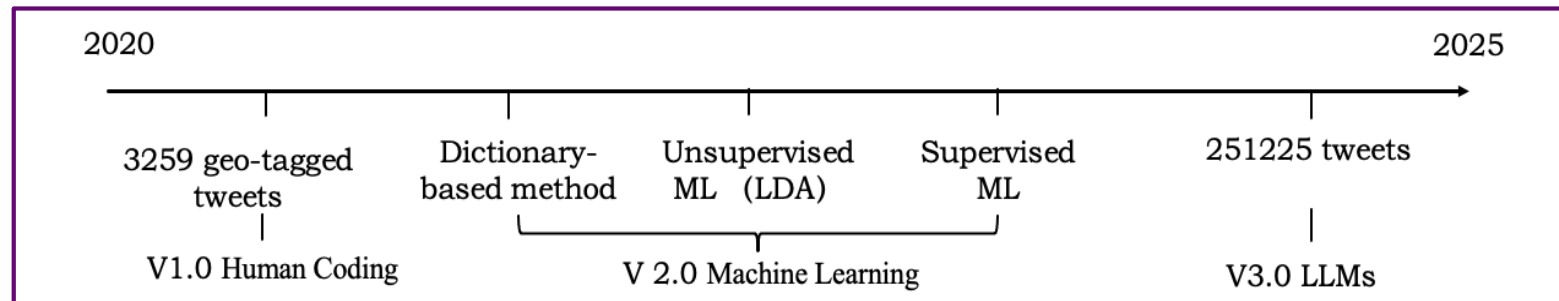
- Tweet Sentiment: Negative
- Tweet Topic: Economics
- User Account Type: Academic
- Account Country of Origin: USA
- BRI membership: No



## Research Design

|    | A                         | B                                        | C                | D               | E             | F           | G        | H        | I              | J                                                             | K           | L           | M             |
|----|---------------------------|------------------------------------------|------------------|-----------------|---------------|-------------|----------|----------|----------------|---------------------------------------------------------------|-------------|-------------|---------------|
| 1  | created_at_tweet          | description                              | favourites_count | followers_count | friends_count | media_count | username | verified | favorite_count | full_text                                                     | quote_count | reply_count | retweet_count |
| 2  | Thu Aug 05 04:21:16 +     | (Product Manager at @Bforeai _           | 15494            | 7774            | 6553          | 13316       |          | FALSE    | 0              | The New Silk Road: R&D Networks, Knowledge                    | 0           | 0           | 0             |
| 3  | Sat Jul 13 15:49:10 +00   | Kinda good to go (sorta).                | 77067            | 3626            | 4992          | 15433       |          | FALSE    | 0              | ngelo Giuliano (@Angelo4justice3)                             | 0           | 0           | 0             |
| 4  | Tue May 21 16:33:14 +     | (Possunt quia posse videntur.            | 5071             | 77              | 1853          | 310         |          | FALSE    | 0              | Western #Balkans have become an increasingly important        | 0           | 0           | 0             |
| 5  | Fri May 20 17:54:18 +0    | China content of The Epoch Times.        | 3059             | 63832           | 100           | 1559        |          | FALSE    | 20             | News Analysis_ Western nations are increasing global          | 2           | 1           | 11            |
| 6  | Mon Sep 05 22:30:34 +     | Data Scientist__   Passionate about m    | 106108           | 3380            | 4928          | 7412        |          | FALSE    | 1              | Despite all the attacks & rantings against China & its        | 0           | 0           | 0             |
| 7  | Thu Jul 12 16:17:43 +0    | (Sign the petition demanding clemency    | 32068            | 3751            | 953           | 358         |          | FALSE    | 11             | One thing has become patently obvious to me, the federal gov  | 1           | 1           | 4             |
| 8  | Sun Jan 17 17:38:06 +0    | Hermetic Bataille Maoism / On a Qi       | 149816           | 5887            | 485           | 2339        |          | FALSE    | 7              | @WoodlouseM - LaRouchite American Belt and Road               | 0           | 0           | 0             |
| 9  | Sat Mar 08 01:48:18 +0    | cis man. engineer? relocating to https:/ | 136195           | 474             | 448           | 280         |          | FALSE    | 1              | @jt2by4 @eminently_me5 @mlhersh When PRC rolled int           | 0           | 1           | 0             |
| 10 | Tue Aug 28 19:39:45 +     | (wearing the guise of a fakeer,          | 23575            | 47              | 155           | 3           |          | FALSE    | 0              | It's called the Belt and Road Initiative.                     | 0           | 0           | 0             |
| 11 | Fri Jun 29 19:07:39 +0000 | 2018                                     | 911              | 28              | 57            | 48          |          | FALSE    | 0              | @WineJerk @musdurken @ryanlcooper Earlier this year, Fr       | 0           | 0           | 0             |
| 12 | Fri Apr 23 10:29:53 +0    | (Militant Atheist._                      | 3803             | 410             | 4954          | 1201        |          | FALSE    | 0              | @TheEconomist Much like the #BeltandRoadinitiative            | 0           | 0           | 0             |
| 13 | Sat May 31 03:35:24 +0    | Vice President @CarnegieEndow; twi       | 26574            | 34326           | 7959          | 2437        |          | FALSE    | 1              | @DrIanHall Catchier than the Belt and Road rap, though ...    | 0           | 1           | 0             |
| 14 | Mon Jun 03 22:15:10 +     | (Author _awn of Eurasia, _elt and l      | 9309             | 118805          | 1752          | 6967        |          | FALSE    | 11             | Listen to "Belt and Road Meets the Pandemic" by Foreign Po    | 0           | 0           | 0             |
| 15 | Wed Mar 24 01:26:11 +     | 18 ML MZT Dengist Stalinist Jucheis      | 10395            | 857             | 1750          | 420         |          | FALSE    | 3              | The One Belt One Road Initiative will help small countries de | 0           | 0           | 0             |
| 16 | Wed Mar 24 01:26:11 +     | 18 ML MZT Dengist Stalinist Jucheis      | 10395            | 857             | 1750          | 420         |          | FALSE    | 3              | @LVKVD @based_eva China achieved 0% poverty in 2020           | 0           | 0           | 0             |
| 17 | Mon Dec 07 16:52:09 +     | Just some angry dude. (static) Clingy.   | 834              | 30              | 182           | 199         |          | FALSE    | 2              | @gematriac59 @jeffery_hails @yao_zilong @fishhead436 @        | 0           | 3           | 0             |
| 18 | Sat Oct 17 00:25:03 +0    | National Taiwan University BA; Univ      | 2                | 6               | 4             | 0           |          | FALSE    | 0              | Answer to What is the main difference between the Belt and I  | 0           | 0           | 0             |
| 19 | Sat Sep 05 22:33:47 +0    | (You do not want to follow me. I AM      | 14615            | 2304            | 105           | 5158        |          | FALSE    | 0              | @scotthill222 Yes. Quality growth, canceling infrastructure,  | 0           | 1           | 0             |
| 20 | Fri Feb 27 08:28:14 +0    | The Hong Kong Trade Development C        | 217              | 2131            | 1846          | 1850        |          | FALSE    | 0              | Excellent networking opportunity at the pre-mission zoom ga   | 0           | 0           | 0             |

## Research Design



### Option 1: Human Coding

- Gold standard for nuanced political sentiment
- Impossible scale; Consistency issues; Cultural bias

### Option 2: Machine Learning

- Handles volume: Scalable for large datasets
- Context-blind (miss irony, cultural expressions); Training limitations

### Option 3: Large Language Models (LLMs)

- Speed + Scale; Contextual understanding; Adaptive flexibility

# Research Design

# [to infer sentiment]

Below is a list of Twitter text details, each row containing row ID, user's country, username, and the full text. Each entry ends with '\_\_END\_\_'. Your task is to label the tweets in the dataset with sentiment scores. Connect all dots. Output "1", "0", or "-1" to each tweet as per the guidelines.

Response must follow this:

[row ID] Sentiment Score; Reason  
[row ID] Sentiment Score; Reason

Zero-shot

Sentiment Labelling Guidelines:

General guidelines:

- The sentiment label should reflect the stance/sentiment of the author rather than face value.
- Keywords can sometimes be misleading as the author of a tweet may quote someone they disagree with, or use rhetorical devices such as sarcasm to convey their stance and message to their audience.

1. Label "1" for Positive Tweets:

- Tweets that express appreciation, praise, or support for the Belt and Road Initiative (BRI)

2. Label "0" for Neutral Tweets:

- Tweets that present a balanced view, factual information, or are unrelated to BRI

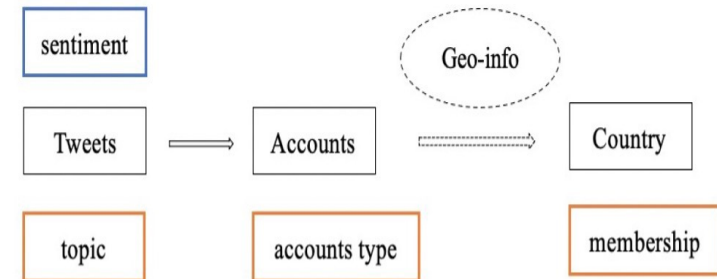
3. Label "-1" for Negative Tweets:

- Tweets that show criticism, concern, fear, etc. about BRI

Twitter text details:

Xxx

Xxx



| D         | E                                                    |
|-----------|------------------------------------------------------|
| sentiment | sentiment_reason                                     |
| 0         | The tweet discusses the potential impact of          |
| 0         | The tweet reports on China's Belt and Road           |
| 0         | The tweet is neutral, discussing the consequences    |
| 1         | The tweet shows positivity about China's involvement |
| -1        | The tweet suggests that Russia is in danger          |
| 1         | The tweet reports on China's new Silk Road           |
| 0         | The tweet mentions Japan's balancing act             |
| 0         | The tweet mentions Georgia and Azerbaijan            |
| 0         | The tweet provides information about the             |
| 1         | The tweet mentions China's One Belt One Road         |
| 1         | The tweet suggests that China and Russia are         |
| 1         | The tweet mentions the opening of a hotel            |
| 0         | Inviting to join an event related to the Belt        |
| 1         | The tweet is mentioning Singapore's United           |
| 1         | The tweet expresses positivity by mentioning         |
| -1        | The tweet reports on the US stepping up its          |
| 0         | The tweet mentions an article on the Belt and        |

# Research Design

## Core LLM Limitations

- Hallucination Risk: May invent sentiments or misread neutral text as emotional
- Black Box Nature: Opaque reasoning makes errors hard to detect
- Output Instability: Same tweet may receive different labels across runs

## What we did:

- Prompt Engineering: 100+ test iterations to optimize instruction clarity
- Human Validation
  - 1% sample (3259) for human coding, 90%+ accuracy achieved against human coding
  - Error repository built for systematic improvement
- Technical Optimization
  - Temperature = 0 for deterministic, replicable results; Zero-shot approach to avoid few-shot bias
  - Multiple runs with consistency checks

## Prompt Design

### V1: Basic

Please read each English tweet and determine whether its attitude toward the Belt and Road Initiative is positive, neutral, or negative.

### V2: Detailed

Please carefully read the following English tweet and determine whether its attitude toward the Belt and Road Initiative (BRI) is **positive**, **neutral**, or **negative**. Then briefly explain the reasoning behind your judgment.

#### Definitions:

**Positive:** Expresses support, praise, anticipation, or views BRI as beneficial

**Neutral:** Remains objective or balanced, or simply states facts without a stance

**Negative:** Expresses criticism, concern, opposition, or views BRI as harmful

**Please answer in the following format:**

Attitude: [Positive / Neutral / Negative]

### Final:

**Role:** You are a political science researcher specializing in IR.

**Task:** Your task is to assign a sentiment label to each tweet and briefly explain the rationale behind your labeling.

#### Sentiment Labeling Guidelines:

Focus on the author's stance, not the literal content or quoted text.

Be cautious of sarcasm, quotes, or indirect expressions that may convey opinions implicitly.

#### Instructions:

1. Label “1” for Positive Tweets: Tweets that express appreciation, praise, or support for the Belt and Road Initiative (BRI)
2. Label “0” for Neutral Tweets: Tweets that present a balanced view, factual information, or are unrelated to BRI
3. Label “-1” for Negative Tweets: Tweets that show criticism, concern, fear, etc. about BRI

For each tweet\_id in INPUT, answer ALL TWO questions below:

Q1: Sentiment score (choose from: 1, 0, -1)

Q2: A one-sentence justification explaining the sentiment score, based on the author's stance.

#### Return format:

Return exactly {number\_of\_line} lines. NO MORE NO LESS.

For each tweet\_id, return one VALID jsonline!

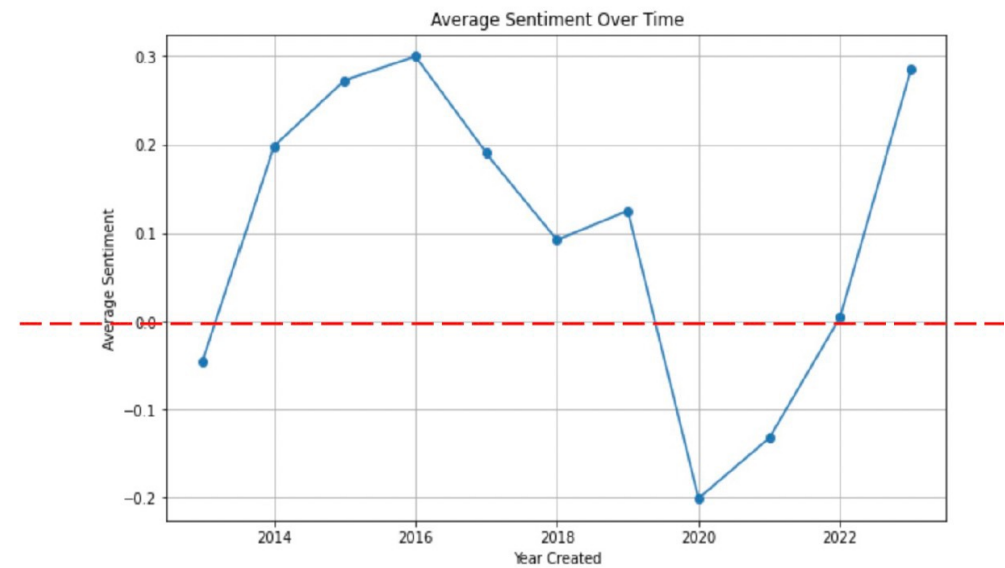
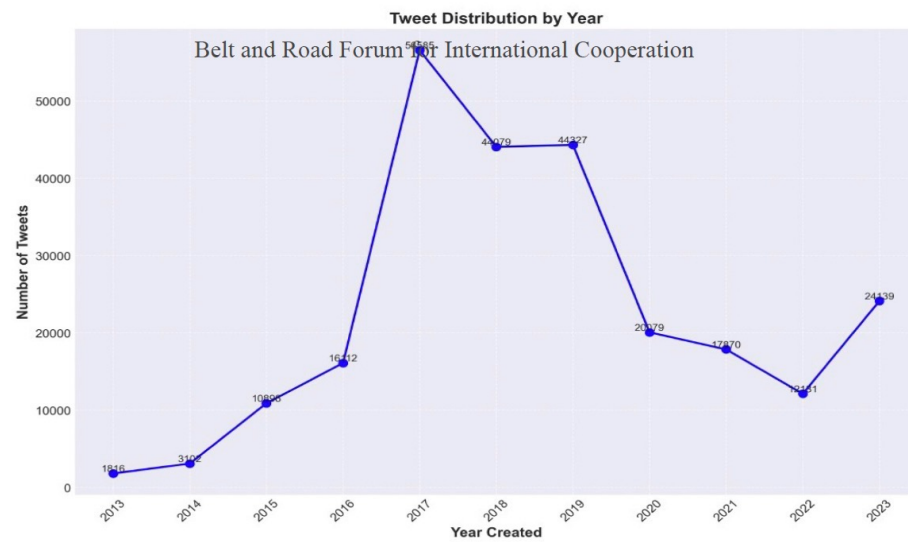
Each jsonline has keys "tweet\_id", "Q1", "Q2". Check JSON format very carefully.

For example:

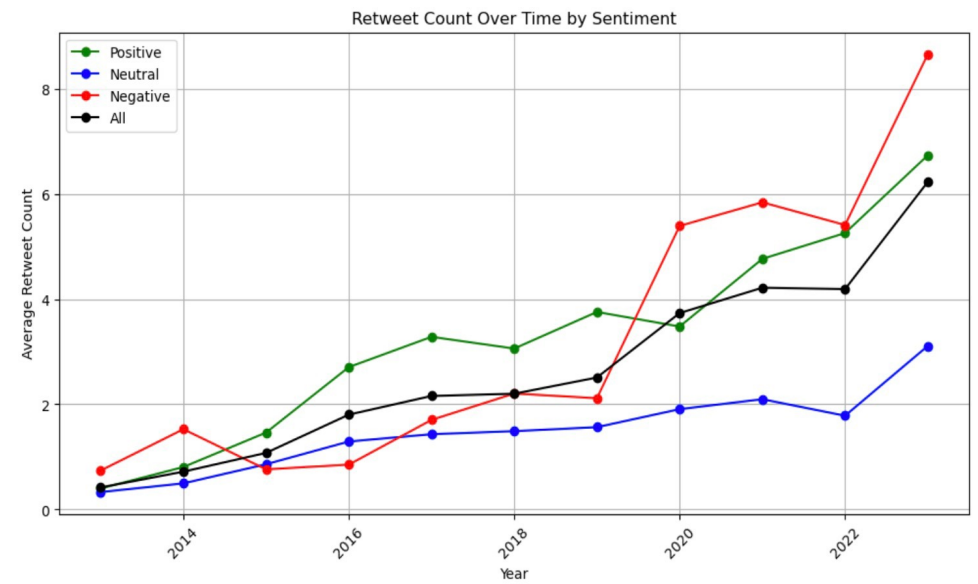
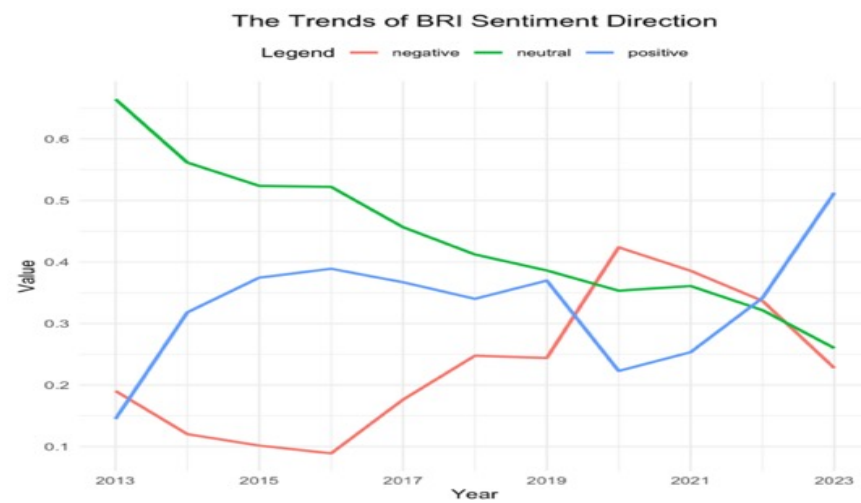
```
{{"tweet_id": "XX", "Q1": "XX", "Q2": "XX"}}
```

```
{{"tweet_id": "XX", "Q1": "XX", "Q2": "XX"}}
```

## Research Findings



## Research Findings

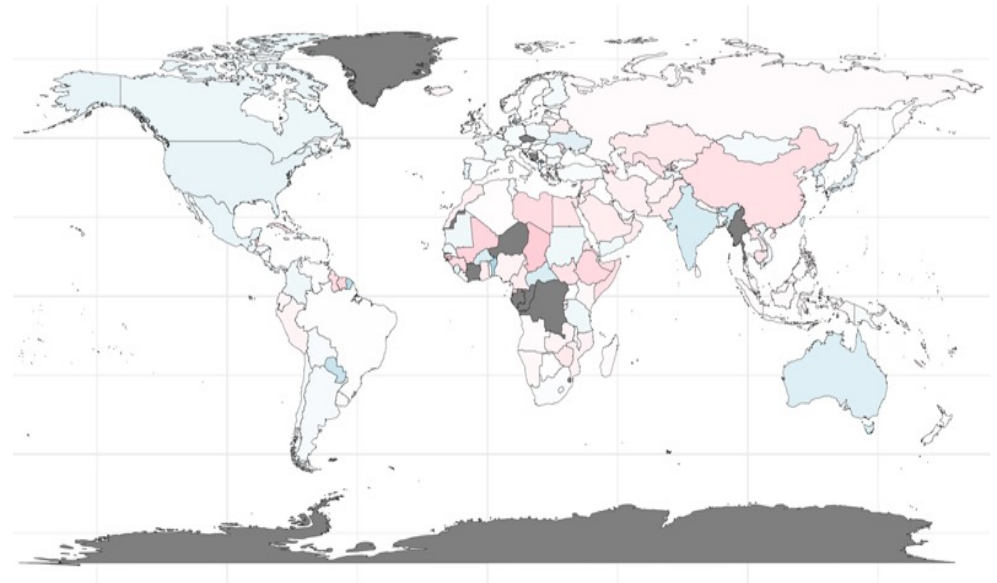




## Research Findings



Tweet Count by Country

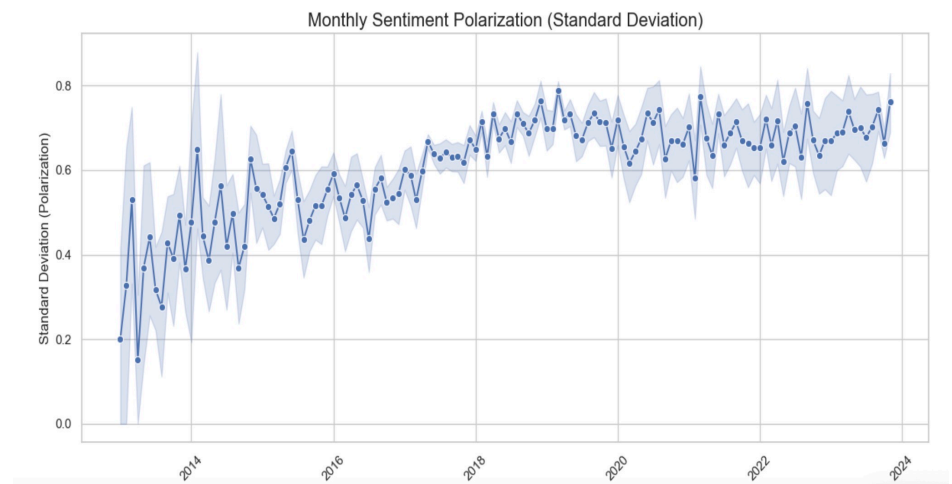
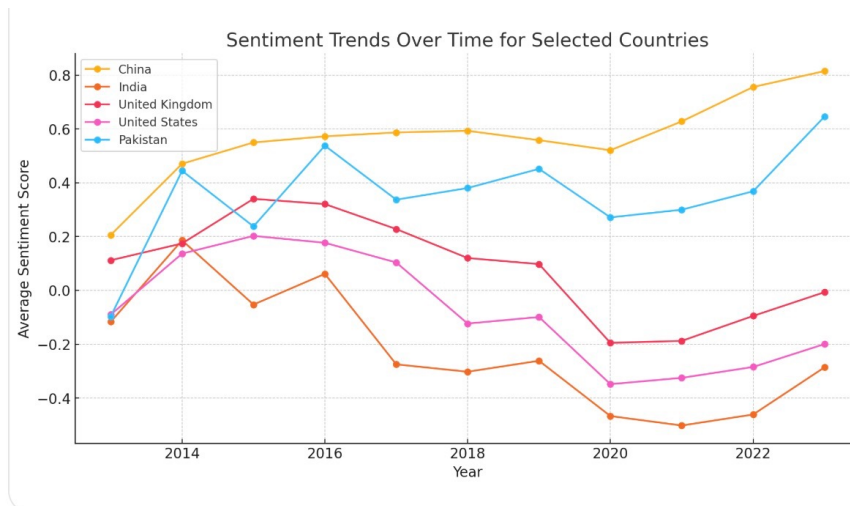


Tweet Sentiment by Country

US (57162) CN (39706) GB (20211) IN (19976) PK(14569)

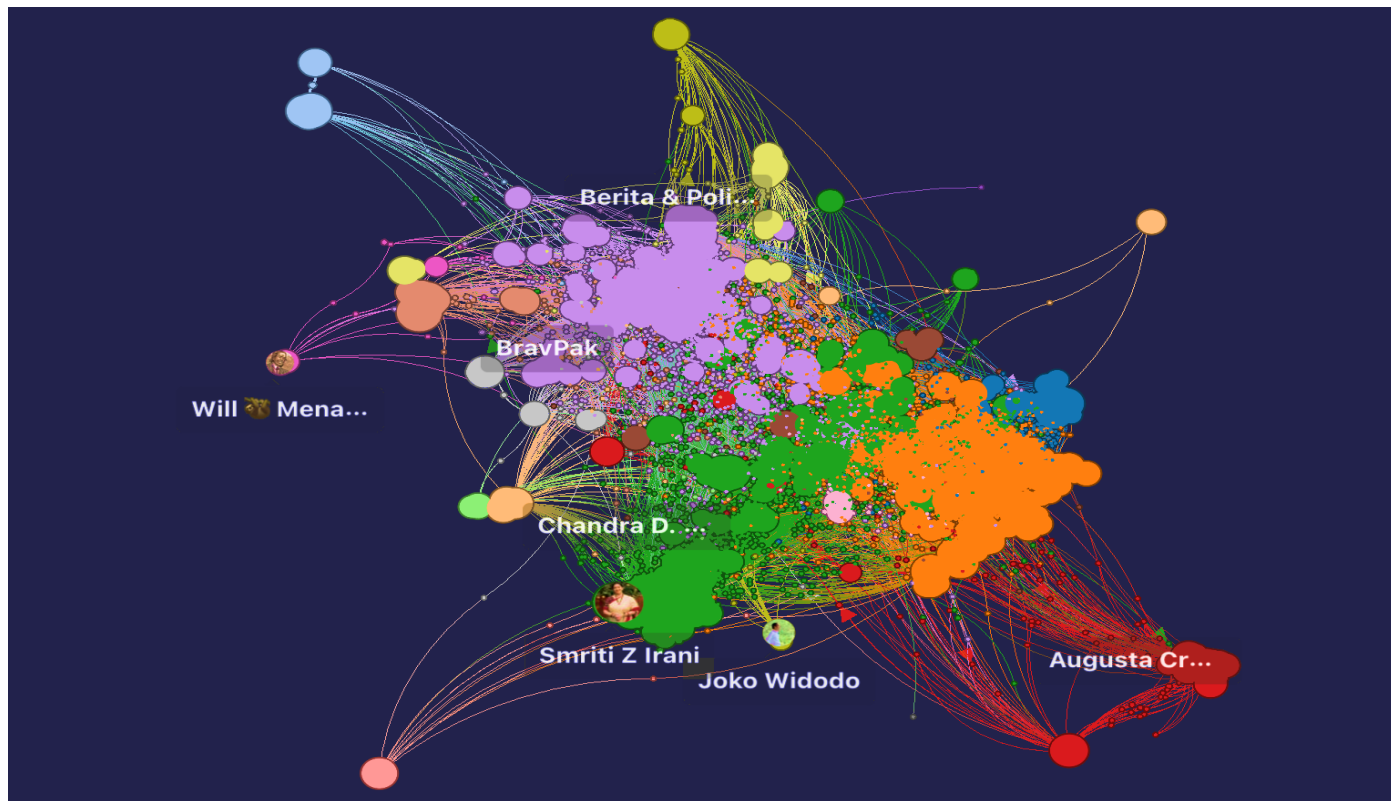


## Research Findings



US (57162) CN (39706) GB (20211) IN (19976) PK(14569)

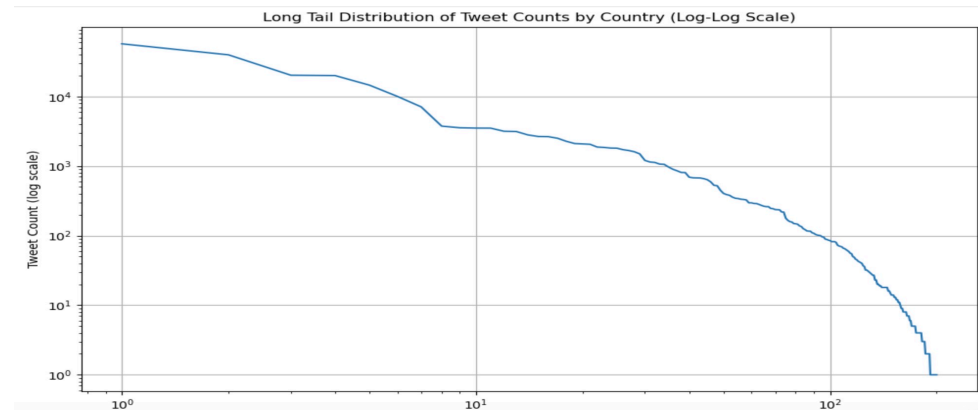
## Research Findings



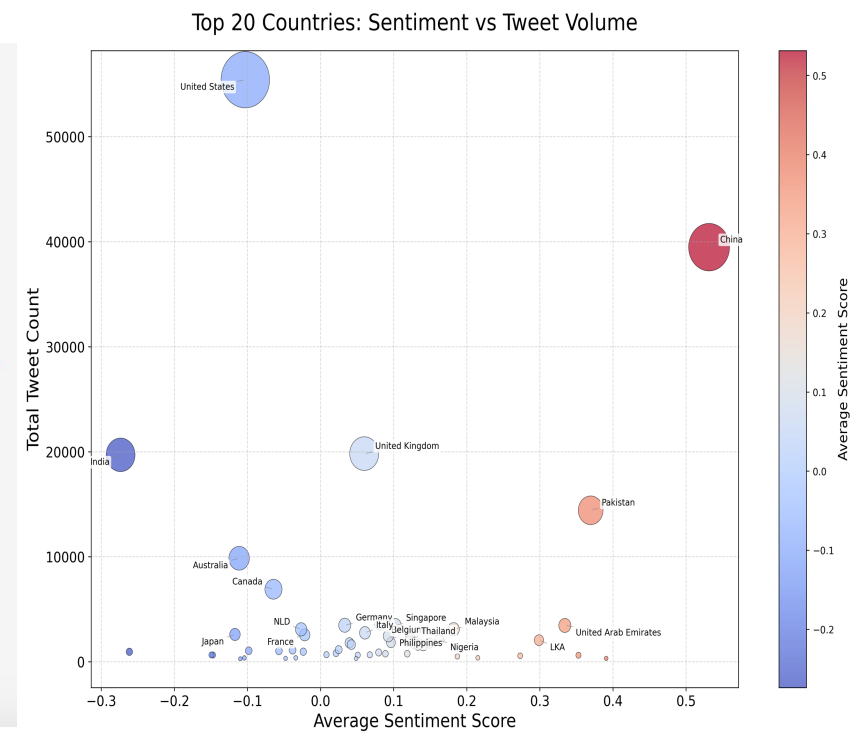
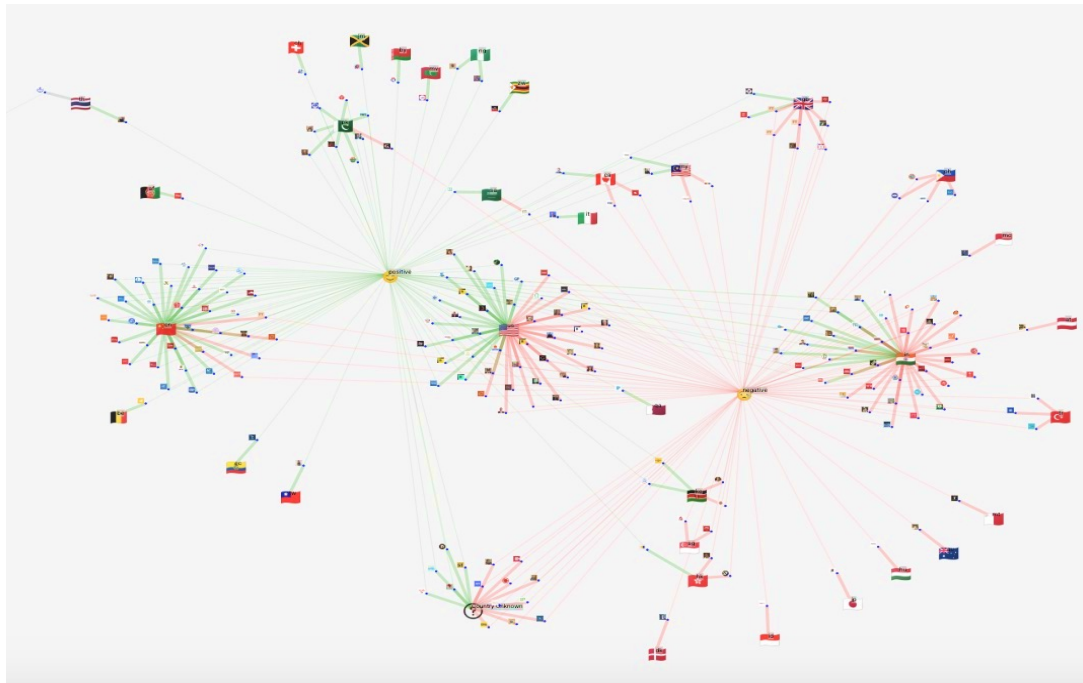
# Research Findings

## Building the Panel Dataset (Country level)

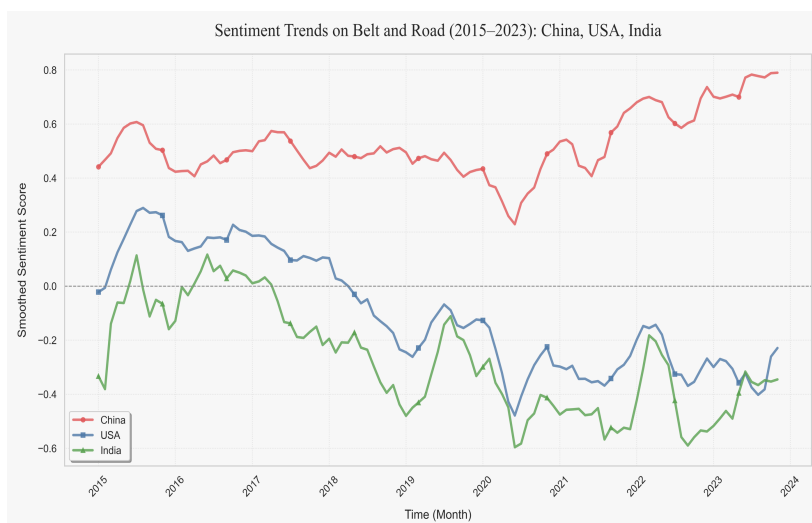
- Volume Threshold Countries with  $\geq 100$  total BRI tweets (153  $\rightarrow$  94 countries)
- Temporal Continuity Excluded countries missing  $>24$  months (94  $\rightarrow$  54 countries)
- Period Selection: Removed 2013-2014 (54  $\rightarrow$  40)
- Final: 40 countries  $\times$  96 months = 3840 observations



## Research Findings: Who Leads the Sentiment



## Research Findings: Who Leads the Sentiment



### Three Emotional Drivers

#### China: The Positive Anchor

- Average sentiment: +0.531 (consistently positive)
- Lowest volatility: 0.153 std dev
- Original sentiment manufacturer setting the narrative tone

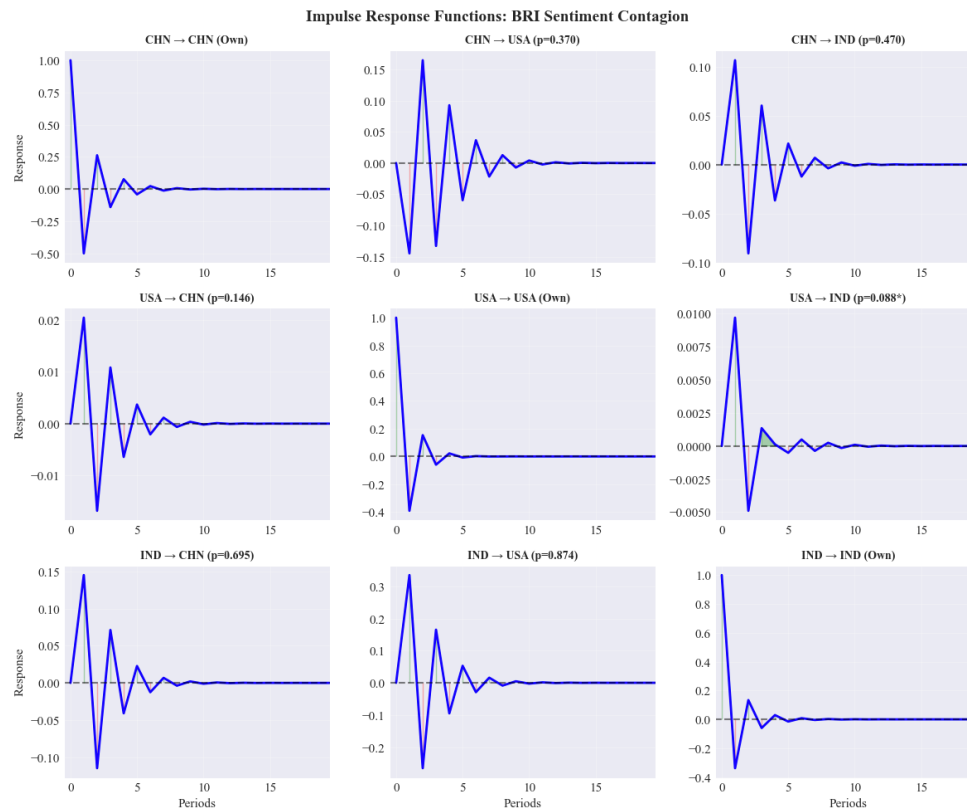
#### USA: The Volume Leader

- Average sentiment: -0.103 (slightly negative)
- Highest tweet volume: 55,437 tweets
- Limited emotional influence despite digital dominance

#### India: The Negative Pole

- Average sentiment: -0.274 (strongly negative)
- Highest volatility: 0.263 std dev
- Reactive sentiment expresser responding to others

## Research Findings: Who Leads the Sentiment



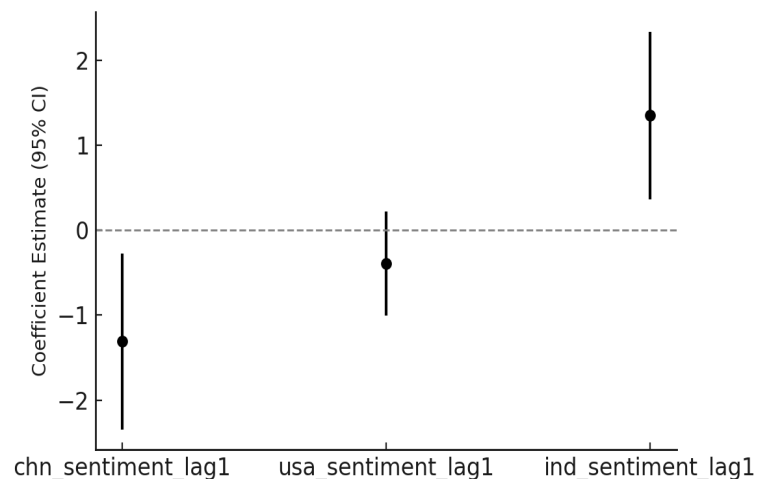
### Contagion is Immediate, Not Lagged

- Maximum responses occur in Period 1-2
- Effects dissipate within 5 periods

### Strongest Emotional Transmissions

1. IND  $\rightarrow$  USA: 0.335 response (Period 1)
2. CHN  $\rightarrow$  USA: 0.164 response (Period 2)
3. CHN  $\rightarrow$  IND: 30.2% variance explained

## Research Findings: Who Follows the Sentiment



### Model Specification:

Unit of Analysis: Country-month panel (40 countries, 2015-2023)

Dependent Variable: country *i*'s average monthly sentiment

Independent Variables: Lagged sentiment of 3 leaders (chn, usa, ind)

Controls: GDP (log); Population (log); Military expenditure (log);

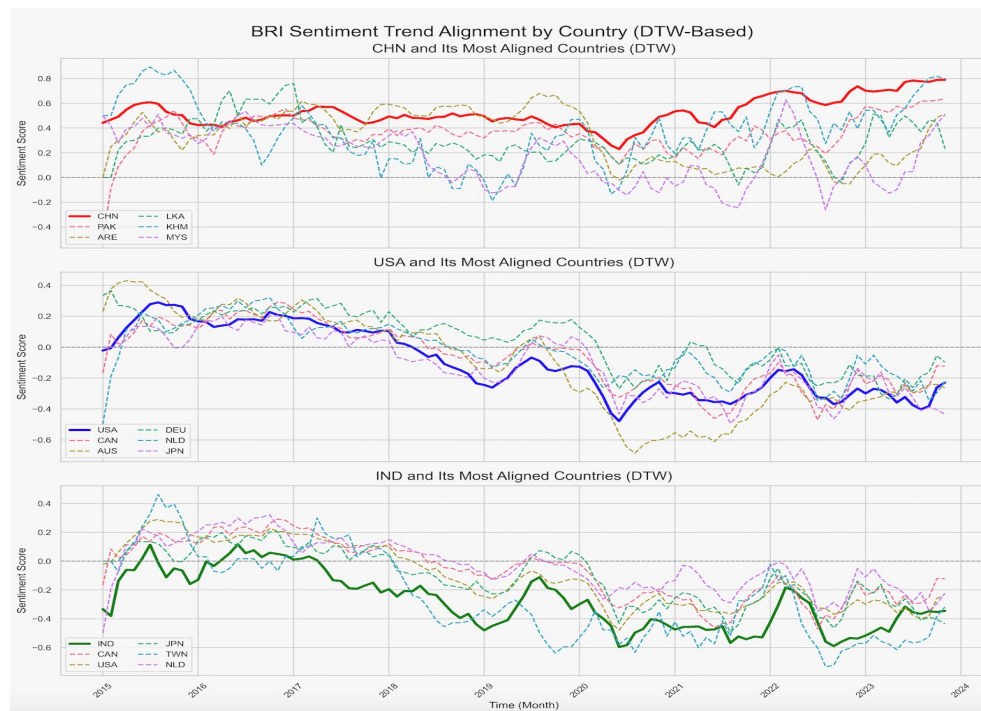
Polity2 score; Tweet count (log); Trade (log)

### Estimation Strategy:

- Fixed Effects: Country + Month
- Clustered standard errors by country
- Robustness: Multiple lag specifications



## Research Findings: Who Follows the Sentiment



### China-Led Group

- Pakistan, UAE, Brazil, South Africa
- Synchronized positive sentiment (0.4-0.8 range)
- Dominated by Global South and BRI recipients

### US/India-Led Group

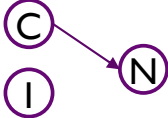
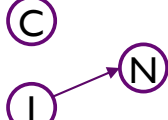
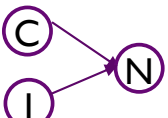
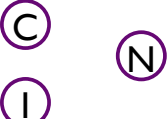
- G7 allies (Japan, UK, France, Canada, Australia)
- Coordinated negative trend accelerating post-2019
- Traditional Western alliance structure
- Sentiment drops from 0.2 to -0.4 over period

### Others: The Hedgers

- Neutral positioning around zero line
- Strategic ambiguity maintained
- Neither following China's optimism nor USA's criticism



## Research Findings: Who Follows the Sentiment

|                                 |                                                                                     |                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positive-Responsive States (8)  |    | ARE (阿联酋)、THA (泰国)、PHL (菲律宾)、PAK (巴基斯坦)、IDN (印度尼西亚)、CHE (瑞士)、ZAF (南非)、BRA (巴西)                                                                              |
| Negative-Responsive States (16) |    | SGP (新加坡)、AUS (澳大利亚)、BEL (比利时)、TUR (土耳其)、NPL (尼泊尔)、MYS (马来西亚)、CAN (加拿大)、MNG (蒙古)、MEX (墨西哥)、ITA (意大利)、GBR (英国)、FRA (法国)、FIN (芬兰)、ESP (西班牙)、NOR (挪威)、JPN (日本) |
| Narrative Conflict Zone (5)     |   | DEU (德国)、AUT (奥地利)、SWE (瑞典)、GRC (希腊)、NLD (荷兰)                                                                                                               |
| Narrative Isolation Zone (8)    |  | NGA (尼日利亚)、NZL (新西兰)、LKA (斯里兰卡)、POL (波兰)、IRL (爱尔兰)、BGD (孟加拉国)、UGA (乌干达)、RUS (俄罗斯)                                                                           |

## Summary

### Key Findings Summary:

- In the digital age, the battle for hearts precedes the battle for minds
- Emotional contagion is immediate and traceable

### Contributions:

- International Relations needs an affective turn → Integrating emotions into core analyses of power, alliances, and order
- Narrative competition is critical battleground of 21st-century great power rivalry → Requires “emotional strategy,” not merely “communication strategy”

### Future Research Directions:

- Granular Analysis by account and topic
- Causal Identification by event



清华大学  
Tsinghua University

请各位老师同学批评指正！

吕蕙伊

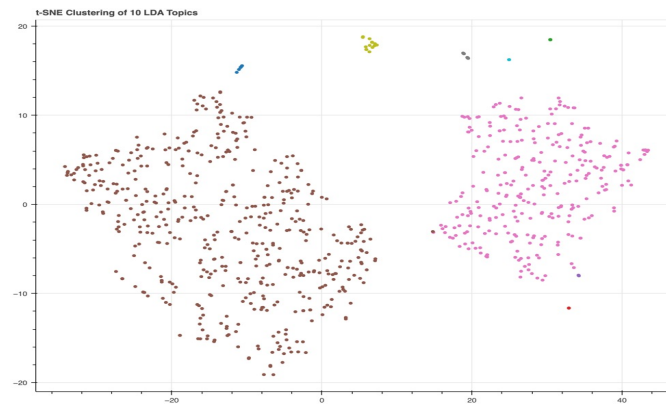
外交学院人工智能社会科学研究系列讲座

2025年10月28日

## NLP Analysis

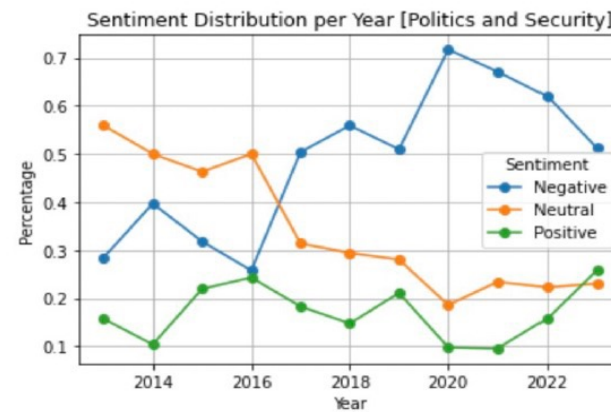
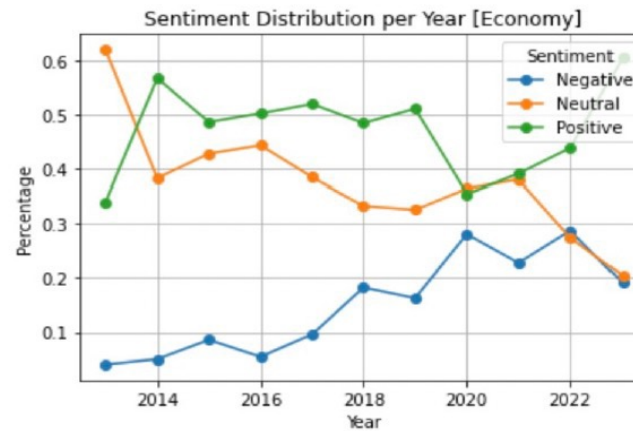
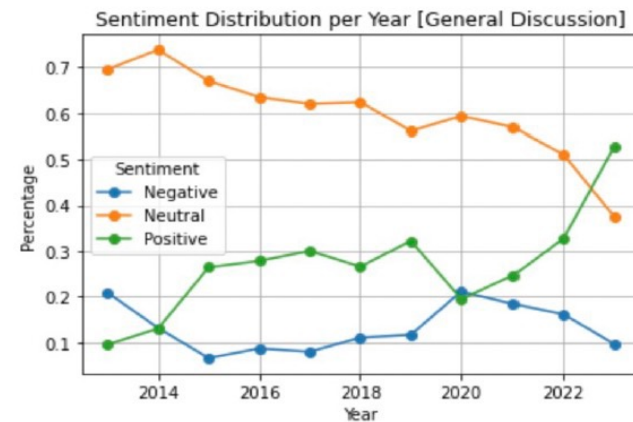


| 0-10          | 10-20        | 20-30        | 30-40        | 40-50       |
|---------------|--------------|--------------|--------------|-------------|
| ('🇺🇸', 2883), | ('🇬🇧', 199), | ('🇬🇧', 137), | ('🇺🇸', 102), | ('🇺🇸', 85), |
| ('🇨🇦', 1285), | ('🇨🇦', 197), | ('🇨🇦', 137), | ('🇨🇦', 99),  | ('🇨🇦', 83), |
| ('🇩🇪', 864),  | ('🇩🇪', 189), | ('🇩🇪', 135), | ('🇩🇪', 97),  | ('🇩🇪', 83), |
| ('🇫🇷', 645),  | ('🇫🇷', 181), | ('🇫🇷', 135), | ('🇫🇷', 97),  | ('🇫🇷', 80), |
| ('🇮🇹', 518),  | ('🇮🇹', 173), | ('🇮🇹', 133), | ('🇮🇹', 95),  | ('🇮🇹', 79), |
| ('🇯🇵', 455),  | ('🇯🇵', 166), | ('🇯🇵', 133), | ('🇯🇵', 91),  | ('🇯🇵', 78), |
| ('🇰🇷', 445),  | ('🇰🇷', 157), | ('🇰🇷', 129), | ('🇰🇷', 90),  | ('🇰🇷', 76), |
| ('🇨🇳', 379),  | ('🇨🇳', 155), | ('🇨🇳', 106), | ('🇨🇳', 87),  | ('🇨🇳', 76), |
| ('🇲🇪', 299),  | ('🇲🇪', 150), | ('🇲🇪', 106), | ('🇲🇪', 87),  | ('🇲🇪', 76), |
| ('🇮🇳', 270),  | ('🇮🇳', 148), | ('🇮🇳', 105), | ('🇮🇳', 86),  | ('🇮🇳', 76)] |

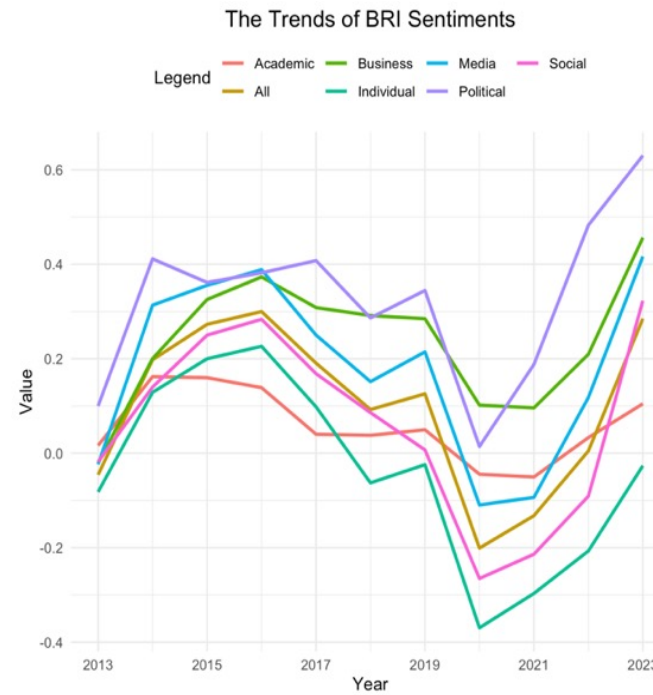
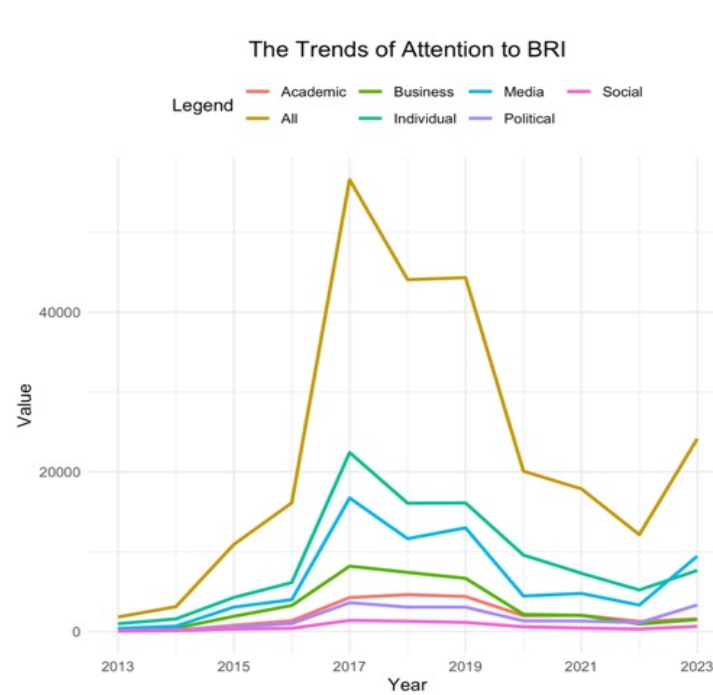


# Descriptive Analysis of BRI Tweet Data: Topic Trends

|                                     |       |
|-------------------------------------|-------|
| topic                               |       |
| Economy                             | 89970 |
| General Discussion                  | 78381 |
| Politics and Security               | 58103 |
| Cultural Exchange                   | 8533  |
| Ecology and Sustainable Development | 5203  |
| Technological Development           | 5027  |
| Social Impact                       | 3750  |
| COVID-19                            | 2258  |



# Descriptive Analysis of BRI Tweet Data: Account Trends



|            |       |
|------------|-------|
| Individual | 97269 |
| Media      | 71407 |
| Business   | 34705 |
| Academic   | 22429 |
| Political  | 18691 |
| Social     | 6678  |