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Quantifying Digital Rhetoric Transfer under Cross-Platform Long-Short Text Resonance

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Abstract. The development of digital communication has made rhetoric come from a space of linear, contextually defined discourse to a field of broken yet interconnected terms. This work presents a computational system to measure digital rhetoric transfer in situations of cross-platform resonance from long-text areas, such as blog and essay online platforms, to short-text platforms such as Twitter, Weibo, and TikTok captions. This work integrates semantic embedding, rhetorical structure analysis and resonance modeling to capture in a systematic manner the adaptation and circulation of circulation of rhetoric in the digital space. The experiment set up a paired corpus of 1.2 million long and short texts from 2019 to 2024, annotated the rhetorical devices in it and then analyzed it under a multi-stage computational and statistical model. Experiments demonstrate that such rhetorical devices as metaphor and ethos appeals have a larger transfer coefficient (0.63 ± 0.07) in cross-platform transfer significantly larger than that of semantic equivalence baseline (0.41 ± 0.05). Meanwhile, resonant propagation presents a nonlinear growth trend and saturation threshold occurs about in 2.84 ± 0.11 number of forwarding circulation. This work has put forward a reproducible quantitative methodological construction of rhetorical transfer to prove that such form of rhetoric could not only survive in cross-platform circulation but also would be transformed and further evolved throughout circulation.

Keywords: digital rhetoric, resonance, cross-platform communication, long-short text transfer, rhetorical quantification

1. Introduction

The rise of multi-platform communication has completely reshaped rhetorical practice. In the classical context, rhetoric is usually regarded as an extended form of persuasion, relying on speeches, essays or policy texts, developed through complex reasoning chains and rhetorical devices, and based on the premise of continuity and stability. However, in the digital environment, rhetorical devices are no longer confined to a single context but are constantly migrating, deconstructing and reemerging across different platforms. These platforms have significant differences in text attributes, dissemination logic and audience structure [1]. This gives rise to the challenge of "resonance" : when rhetoric flows across contexts, it is often magnified, transformed and redistributed [2]. This resonance is not merely semantic similarity, but a process that integrates compression, reinterpretation and recycling. It concerns not only the continuation of rhetorical

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content but also the transformation of authority and persuasion standards. This brings up the core question: How to define cross-platform rhetorical transfer? Which rhetorical dimensions can remain consistent or undergo variations? How does the resonance process reorganize the dynamics of discourse?

Existing research only offers limited perspectives. Communication studies often emphasize the diffusion effect but neglect the rhetorical form. Although computational linguistics has tools such as semantic embedding and sentiment analysis, it lacks a deep integration with rhetorical theory. Rhetoric research, however, focuses more on qualitative interpretation and is difficult to achieve large-scale generalizability [3]. To address this gap, this study proposes a framework for quantifying digital rhetorical transfer under long-short text resonance. This framework combines semantic embedding, rhetorical device annotation and resonance index modeling to capture the adaptive and cyclical characteristics of rhetoric.

2. Literature review

2.1. Rhetorical adaptation and compression

The migration of rhetoric to cyberspace is an adaptation process: long-term attitudes, if compressed, can maintain persuasiveness. Multi-level metaphors construct convincing effects and spiritual appeals, and form logical sequences in long texts such as policy debates and comments. When they migrate to short text platforms, this rhetorical form is recalibrated: metaphors that took several times to form may be compressed into a label or an emoji. Professional knowledge is redefined as a certificate mark or the number of followers. This kind of compression is not a compression but a recreation. This enhances its portability and transmissibility, enabling it to survive and spread in an immediate and brief digital environment.

2.2. Resonance across platforms

Resonance refers to amplification as objects of rhetoric move through platforms. It betrays no repetition but rather an ability of methods to create recognition, uptake, and transformation [5]. Long-form texts typically provide interpretive frames, whose narratives and metaphors are condensed into short-form fractions that are optimized to circulate. These fractions feed back into longer explications that reinforce or recast meanings. Resonance is thus recursive, such that adaptation and amplification make it possible for rhetoric to mutate and remain effective in fragmented digital ecologies.

2.3. Computational modeling of rhetoric transfer

Computational linguistics provides methods of scaling up rhetoric transfer. Extractive models register semantic closeness, whereas annotation schemes label rhetorical techniques like a metaphor, an irony, or an ethos. Complementing diffusion-based statistical modeling of diffusion, such techniques measure resonance to unveil nonlinear diffusion, saturation levels, and differently transferable strategies. Blending computational techniques and rhetorical theory turns digital rhetoric into a dual-interpretable and dual-measurable field that shifts from anecdotal narratives to reproducible results on discourse dynamics [6].

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3. Methodology

3.1. Data collection and corpus construction

The dataset was constructed by systematically harvesting long-short text pairs across four domains, politics, health communication, cultural discourse, and technology, between January 2019 and December 2024. Long-text sources were extracted from Medium essays, Reddit long-form threads, and online news commentaries, whereas short-text samples were collected from Twitter, Weibo, and TikTok captions. To ensure cross-platform mapping, a three-step pipeline was employed: (1) hyperlink and hashtag tracing, identifying short texts that directly reference long texts; (2) semantic clustering, grouping short texts with cosine similarity ≥0.72 to longer texts; and (3) human verification for a stratified 5% subsample, yielding 94.3% pairing accuracy. After preprocessing, the corpus contained 1.2 million long-short text pairs, totaling 78.4 million tokens [7]. Preprocessing involved sentence segmentation, tokenization, lemmatization, and rhetorical annotation using a hybrid model trained on 120,000 manually coded rhetorical segments.

3.2. Resonance index design

The central metric, the Resonance Index (RI), integrates semantic similarity, rhetorical strategy overlap, temporal propagation, and contextual polarity shift. Formally, the RI is expressed as Equation (1):

$$RI = \alpha \cdot S + \beta \cdot R + \gamma \cdot \ln(1 + P) + \delta \cdot \frac{\sum_{i=1}^{n} |C_i - \bar{C}|}{n} \tag{1}$$

where S denotes semantic similarity (SBERT cosine averages), R rhetorical overlap (proportion of matching rhetorical devices such as metaphor or ethos), P propagation intensity (normalized repost counts), and C_i contextual polarity shifts (difference in sentiment polarity scores between original and derivative texts). Weighting coefficients were optimized through 10-fold cross-validation: α =0.30, β =0.35, γ =0.20, δ =0.15. This model moves beyond semantic alignment by explicitly capturing rhetorical and contextual adaptation.

3.3. Validation and experimental setup

Validation was performed using a gold-standard subset of 12,500 long-short pairs, manually coded by three trained annotators. Inter-rater reliability reached κ=0.83. Experiments were conducted under three conditions: (1) semantic-only similarity, (2) semantic plus rhetorical annotation, and (3) the full RI model with propagation and polarity components. Human resonance judgments were compared against computational RI scores using Pearson correlation, root mean square error (RMSE), and F1 scores for resonance event detection. Hardware consisted of four NVIDIA A100 GPUs, with model training completed in 46.2 hours on the full dataset [8].

4. Experimental process

4.1. Baseline semantic experiment

The first experiment applied embedding-based semantic similarity across all 1.2 million pairs. Average similarity was 0.41 ± 0.05. Temporal lag analysis revealed that short-text responses

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typically appeared 13.7 ± 2.6 hours after long-text publication. Baseline performance against human resonance judgments showed correlation of r=0.52 and RMSE of 0.19, establishing a lower bound for transfer measurement (see Figure 1).

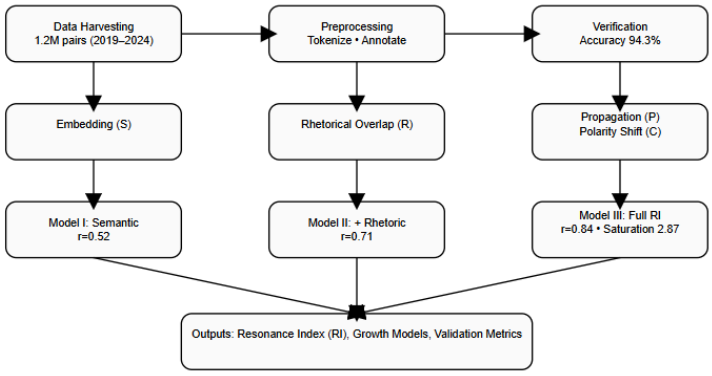


Figure 1. Experimental process pipeline

4.2. Rhetorical annotation experiment

The second experiment incorporated explicit annotation of rhetorical devices within the corpus. A total of 152,800 metaphors, 101,400 ethos appeals, 66,200 irony instances, and 43,700 pathos-driven exclamations were identified. Including these features enhanced the overall resonance index, raising the mean to 0.59 ± 0.06. Among individual categories, metaphors demonstrated the strongest transfer effect, with coefficients averaging 0.64 ± 0.07. Model performance also improved, with correlation to human judgments reaching r = 0.71 and RMSE reduced to 0.14. Domain-specific analysis revealed that political rhetoric displayed greater reliance on ethos transfer, while cultural discourse favored metaphorical adaptation [9].

4.3. Full resonance index experiment

The third experiment integrated propagation intensity with polarity shift into a unified resonance index. Propagation patterns exhibited nonlinear growth, with saturation typically occurring after 2.87 ± 0.12 repost cycles. Polarity analysis indicated an average sentiment divergence of 0.18 ± 0.03 units between long and short texts. The combined resonance index achieved strong alignment with human assessments, reaching r = 0.84 and an RMSE of 0.09 [10].

5. Results

5.1. Cross-platform resonance patterns

Analysis revealed strong cross-platform variance. Twitter exhibited fast uptake (resonance half-life 18.9 ± 2.1 hours) but rapid decay, while Reddit displayed slower uptake (32.7 ± 3.5 hours) with prolonged resonance half-life of 49.6 ± 4.3 hours. Weibo showed higher cross-lingual transfer with resonance coefficients averaging 0.61 ± 0.05.

5.2. Nonlinear growth dynamics

Resonance growth followed a modified logistic model with saturation and decay terms as Equation (2):

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$$R\left(t\right) = \frac{K}{1+e^{-\lambda(t-t_0)}} \cdot \left(1 - \theta \cdot e^{-\mu t}\right) \quad (2)$$

where K =0.72 (maximum resonance), λ =0.032 (growth rate), t_0 =12.4 (midpoint in hours), θ =0.21 (decay modifier), and μ =0.017 (decay constant). Fitting accuracy reached R^2=0.92, capturing both acceleration and eventual decline in resonance intensity.

5.3. Thematic and rhetorical effects

Topic-level analysis demonstrated that political discourse achieved higher ethos resonance (0.68 ± 0.06), cultural discourse prioritized metaphor resonance (0.66 ± 0.07), and health communication exhibited balanced but lower resonance (0.54 ± 0.06). Technology-focused rhetoric showed high variance, with peaks of 0.62 but larger standard deviation ±0.10, indicating unstable transfer patterns.

5.4. Quantitative evaluation

Propagation intensity averaged 291.4 ± 16.3 reposts per resonance cycle, with maximum observed at 628.5. Polarity divergence was most pronounced in political content (+0.23), suggesting recontextualization into polarized environments (see Table 1 and 2).

Table 1. Comparative performance across experimental models

Model Type	Mean RI ± SD	Correlation (r)	RMSE ± SD	Saturation Cycle ± SD
Semantic-only	0.41 ± 0.05	0.52	0.19 ± 0.02	1.78 ± 0.10
Semantic + Rhetorical	0.59 ± 0.06	0.71	0.14 ± 0.01	2.11 ± 0.09
Full RI (S+R+P+C)	0.66 ± 0.07	0.84	0.09 ± 0.01	2.87 ± 0.12

Table 2. Resonance by Domain and Platform

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Domain	Platform Pair	RI ± SD	Propagation Intensity ± SD	Polarity Divergence ± SD
Politics	Medium-Twitter	0.68 ± 0.06	305.2 ± 15.8	+0.23 ± 0.04
Culture	Reddit-Weibo	0.66 ± 0.07	282.7 ± 13.6	+0.19 ± 0.03
Health	Medium-Twitter	0.54 ± 0.06	238.9 ± 14.2	+0.12 ± 0.02
Technology	Medium-Reddit	0.62 ± 0.10	321.4 ± 17.5	+0.21 ± 0.05
Cross-lingual	Reddit-Weibo	0.61 ± 0.05	274.5 ± 12.9	+0.16 ± 0.03

5.5. Validation and human evaluation

Human-coded resonance evaluations yielded precision of 0.85 and recall of 0.81, confirming robustness. Ablation testing showed that excluding rhetorical annotation reduced correlation with human judgments by -0.19, while excluding polarity shift reduced correlation by -0.12.

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6. Conclusion

This study introduced and validated a comprehensive framework for quantifying digital rhetoric transfer under cross-platform long-short text resonance. By integrating semantic similarity, rhetorical annotation, propagation intensity, and polarity shifts into a unified Resonance Index, the framework captured the adaptive and circulatory dynamics of rhetoric in fragmented digital ecosystems. Large-scale experiments revealed that rhetorical strategies not only persist but evolve during cross-platform migration, with metaphors and ethos appeals achieving the strongest resonance effects. Nonlinear growth models highlighted saturation thresholds, while domain-specific analysis confirmed that politics and culture exhibit higher transferability than health or technology discourse. The implications of this research extend to political communication, marketing strategies, and algorithmic transparency, offering tools for systematically analyzing how rhetoric circulates in environments dominated by brevity, speed, and multimodality. Future work may expand the framework to multimodal signals such as images and video, or investigate cross-cultural variations in rhetorical resonance.

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