

ABSTRACT

TEMPORAL ANALYSIS OF BRANDING CONSISTENCY ON X USING TOPIC MODELING AND SENTIMENT SCORING

by

Wenka Wendira Putri Bun

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Personal branding on social media is shaped by the consistency of communication over time, particularly in terms of topical focus, emotional tone, and audience engagement. Public figures operating on X communicate within a dynamic environment where discourse evolves rapidly, making branding consistency difficult to assess using static analytical approaches. This research examines long-term communication patterns by analyzing 55,099 original tweets posted by Elon Musk between 2010 and 2025.

Existing studies on social media branding often examine topic modeling, sentiment analysis, or engagement metrics independently, with limited consideration of temporal dynamics and cross-dimensional integration. As a result, current approaches struggle to capture branding consistency as a longitudinal and multi-dimensional construct. To address this gap, this research proposes an integrated computational framework that combines unsupervised topic modeling, temporal analysis, engagement-weighted salience, and sentiment scoring.

Three topic modeling approaches, Latent Dirichlet Allocation (LDA), BERTopic, and the Dynamic Embedded Topic Model (DETM), are implemented individually and evaluated using semantic coherence, topic diversity, and temporal topic coherence metrics. The evaluation results indicate that DETM outperforms LDA and BERTopic in capturing temporally stable and semantically coherent topic evolution. Based on the DETM output, topics are consolidated into nine semantic categories and further analyzed using engagement-weighted salience and sentiment analysis to assess branding dynamics.

The findings reveal that high-engagement themes such as Social Issues & Commentary, Politics, Philosophy, and Entertainment generate the strongest audience interaction, while core brand pillars related to Technology, Space, and Business exhibit more moderate engagement levels. Sentiment analysis indicates a predominantly positive emotional tone across the dataset, with increased polarization observed in sociopolitical topics. Quantitative evaluation shows high emotional alignment (91.2%) and engagement efficiency (100%), contrasted with relatively low topical alignment (33.6%), resulting in an overall branding consistency score of 70.0%.

These results demonstrate that integrating temporal topic modeling with audience engagement and sentiment measures provides a robust and interpretable approach for assessing branding consistency over time. The proposed framework extends the application of dynamic topic models by incorporating human-centered evaluation, making it suitable for analyzing personal branding strategies of public figures in dynamic social media environments.

Keywords: Branding Consistency, Topic Modeling, Dynamic Embedded Topic Model (DETM), Latent Dirichlet Allocation (LDA), BERTopic, Sentiment Analysis, Engagement-Weighted Salience, Social Media Analysis, X (Twitter)