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Semantic Polarization in U.S. Politics: A Computational Analysis of Republican and Democratic Speeches

Amritesh Banerjee[1], Bhuvi Joneja[2]

[1] Cambridge International School, Dubai, United Arab Emirates

[2] Delhi Private School, Dubai, United Arab Emirates

Abstract

This research investigates the evolution of U.S. political rhetoric over the past eighty years, focusing on how thematic priorities and emotional framing have influenced partisan discourse. The study applies computational methods, including semantic similarity and sentiment analysis, to presidential nomination speeches from 1944 to 2024, with the aim of understanding patterns of ideological alignment, divergence, and rhetorical strategy. Beyond identifying these patterns in party messaging, the research examines how differences in thematic emphasis and emotional tone shape voter perception, engagement, and political polarization. By combining quantitative linguistic analysis with historical and political context, the study provides insight into the mechanisms through which political language both mirrors and reinforces broader social and ideological divisions in the United States.

Keywords: political polarization, semantic similarity, sentiment analysis, presidential nomination speeches, computational linguistics, rhetoric and discourse analysis, term frequency-inverse document frequency (TF-IDF), partisan language divergence, affective polarization, U.S. presidential elections, natural language processing (NLP), Jaccard similarity

1. Introduction

Political discourse in the United States has undergone significant transformation over the past century, affecting not only policy content but also rhetorical style, emotional tone, and approaches to persuasion. Recent empirical research indicates that political language is shifting away from evidence-based reasoning toward more emotionally charged, subjective rhetoric, with important implications for democratic governance.

An essential part of understanding political rhetoric is recognising that all speeches—whether political, academic, or ceremonial—follow a structured format designed to achieve specific communicative goals. Across contexts, public speaking

pedagogy emphasises that a speech typically consists of three core components: an introduction that captures attention and establishes purpose, a body where the substantive arguments and evidence are presented in logical progression, and a conclusion that reinforces the key message and leaves a lasting effect on the audience. This structural organisation supports clarity, coherence, and persuasion, and is central to effective communication in diverse domains (Language Through Literature, 2024).

Beyond structural elements, speeches also deploy rhetorical appeals that blend credibility, logic, and emotion to engage audiences. Classical rhetorical theory, rooted in Aristotle, highlights ethos (the speaker's credibility), logos (logical argumentation), and pathos (emotional resonance) as foundational to persuasive discourse; these appeals continue to inform modern speech analysis and illustrate how speakers adapt style and content to influence interpretation and judgment (Robinson & Jerskey, 2021). This framework not only applies to individual speeches but also enables meaningful comparison across genres of political oratory—for instance, contrasting nomination acceptance speeches with inauguration addresses reveals differences in purpose, audience engagement, and emotional framing, with acceptance speeches often designed to mobilise partisan support and inaugurals shaped to articulate vision and national unity (Koller & Semino, 2019).

This shift in "feeling" is not just a move toward extreme positivity or negativity. As the French expression "comme ci, comme ça" suggests, most of human sentiment stays in the middle ground—a state of calculative neutrality. Computationally, this neutrality acts as a proxy for policy-heavy discourse. In the 1940s and 50s, a high ratio of neutral scores in VADER reflected a focus on administrative governance that surpassed partisan emotion.

A study published in Nature Human Behaviour (2025) analyzed over 8 million congressional speeches from 1879 to 2022 (Bhatia, Lewandowsky, & Politzer, 2025). The results show a decline since the 1970s in the use of fact-based language, such as "data," "analysis," "evidence," and "investigation," alongside a rise in opinion-based expressions, including "point of view," "believe," "common sense," and "feel." The authors argue that this move away from evidence-based rhetoric correlates with increasing political polarization, reduced legislative productivity, and growing socio-economic inequalities.

This trend has coincided with broader phenomena, including increasing political polarization, declining legislative cooperation, and rising socio-economic inequality. Empirical studies suggest that these patterns are linked to changes in political language, which has become more emotionally charged and less grounded in shared facts or evidence. Research on partisan speech over the past 130 years indicates that the phrasing and rhetorical markers associated with each major party have grown increasingly distinct and divergent. This growing divergence reflects not only differences in policy but also strategic choices in how parties communicate, reinforcing partisan identities and shaping public perception.

Furthermore, these shifts raise critical questions about the health of democratic discourse. When political communication moves away from shared reference points and parties adopt increasingly divergent rhetorical registers, opportunities for consensus or mutual understanding may diminish. Scholars have described this process as Affective Polarization, in which partisans not only disagree on issues but also increasingly distrust and dislike members of the opposing party (Gidengil & Stolle, 2022). Such polarization is part of a broader transformation in U.S. political communication, with implications for governance, civic engagement, and social cohesion.

This study examines whether U.S. presidential rhetoric demonstrates patterns of semantic drift, such that the lexical

overlap between a party's contemporary platform and its historical baseline declines over time, alongside a growing emphasis on evaluative or subjective framing. Drawing on a Natural Language Processing (NLP) pipeline applied to eighty years of presidential nomination speeches, the analysis evaluates whether these shifts align with identifiable historical epochs or vary in relation to contextual factors such as convention location and timing.

Rather than proposing a novel methodological framework, the study builds on established computational techniques in political text analysis, including vector-space modeling and cosine similarity. Its contribution lies in the sustained, longitudinal application of these methods to a clearly bounded and politically significant corpus: presidential nomination acceptance speeches from 1944 to 2024. By integrating quantitative semantic measurement with historical and political contextualization, the study offers a systematic account of rhetorical change in partisan discourse. The results indicate that recent patterns of divergence extend beyond routine cyclical variation from previous election cycles that reflect shared lexical framing.

2. Related Works

The intersection of computational linguistics and political science has produced a robust body of literature focused on identifying and quantifying ideological shifts. This study situates itself with three primary pillars: historical language analysis, semantic similarity modelling, and sentiment analysis.

Recent scholarship has increasingly utilized large-scale datasets to track the evolution of political discourse over centuries (Aroyehun et al., 2025) (Ash, Morelli, & Vannoni, 2024) demonstrate a shift in evidence-based reasoning to intuition-based decision making in over 8 million congressional speeches, a trend they associate with rising polarization. Likewise, researchers have utilized (Card et al., 2022) 140 years of U.S political addresses to show immigration framing has become more positive. This study builds on these frameworks by focusing on the critical environment of the presidential nomination speeches from 1944 to 2024.

Furthermore, the quantification of partisan differences relies on high-dimensional text-as-data methods. Researchers have developed (Gentzkow, Shapiro, & Taddy, 2019) metrics for partisan classification, highlighting that political speeches can be classified by party with a high level of accuracy due to lexical divergence. Adding on, this is further expanded when a 2020 review of computational text analysis gives the theoretical justifications for applying TF-IDF, word embeddings to social sciences (Gentzkow, Kelly, & Taddy, 2019). Moreover, the application of word embeddings and Cosine Similarity to quantify ideological placement has been validated (Rheault & Cochrane, 2020) and this study uses Jaccard score and TF-IDF Cosine Similarity to measure the degree of "thematic alignment" versus "ideological siloing" between candidates.

Beyond thematic content, the emotional valence of political speech is a primary driver of polarization. A 2019 review synthesizes research on affective polarization, where the partisans exhibit emotional dislike beyond just policy disagreements (Iyengar et al., 2019) and has provided the theoretical grounding for the findings on emotional framing in nomination speeches, emphasizing how rhetorical strategies fuel polarization in U.S politics over time. The use of VADER (Valence Aware Dictionary and Sentiment Reasoner) has become a standard of measuring emotional intensity in politically charged texts (Hutto & Gilbert, 2014). Recent uses of VADER to State of the Union addresses (Gustafsson, 2025) and candidate communications (Tavits & Potter, 2022) suggest that emotional tones may lead to opinionated engagement.

3. Methodology

The research presented in this paper employs a quantitative approach to analyze political polarization through the lens of language. The methodology is designed to collect, clean, and analyze a large corpus of political discourse using advanced natural language processing techniques. This section details the steps taken to construct the analytical framework.

4. Data Collection

The corpus for this study was sourced from the American Presidency Project (APP) at the University of California, Santa Barbara. This archive provides a comprehensive collection of presidential public documents, including speeches, letters, and conference transcripts. The dataset selected for this research consisted of convention speeches, specifically those accepting presidential nominations, from 1944 to 2024.

Once the raw data was collected, it underwent a preprocessing pipeline to prepare the texts for linguistic analysis. The speeches were stored as .docx files and thoroughly cleaned to ensure accurate results. The first step removed capitalization and punctuation. All characters were then converted to lowercase to ensure consistency within the document. Next, stop word filtering removed common words with minimal semantic value, leaving only terms with true meaning. The final step was lemmatization, which converted words to their base form (e.g., “running,” “ran,” and “runs” all become “run”). This process grouped semantically equivalent terms, which was essential for accurate embeddings and similarity analysis.

5. Algorithmic Formalism Explained

5.1. Jaccard Similarity

Jaccard Similarity (J) measures the overlap between the unique vocabulary of two datasets, in this case, the Democratic and Republican speeches. This metric quantifies the ratio of shared unique words relative to all unique words in both speeches. Let V_D represent the cleaned and lemmatized words in the Democrat dataset, and V_R the same for the Republican dataset. The Jaccard Similarity is defined as the size of the intersection divided by the size of the union.

$$J(V_D, V_R) = \frac{|V_D \cap V_R|}{|V_D \cup V_R|}$$

The score ranges from 0, indicating very high vocabulary divergence, to 1.0, indicating nearly identical vocabulary with minimal divergence.

5.2. Cosine Similarity on TF-IDF Vectors

Semantic similarity is assessed using Cosine Similarity applied to document vectors weighted by Term Frequency-Inverse Document Frequency (TF-IDF). This method emphasizes words that are unique to one document while down-weighting common words shared between both speeches.

TF-IDF weight calculation. The weight $W_{t,d}$ of any pre-processed term t in a speech d is the product of its Term Frequency (TF) and Inverse Document Frequency (IDF):

$$W_{t,d} = \mathrm{TF}(t, d) \times \mathrm{IDF}(t)$$

TF is the raw count of the term in the document, with higher values indicating centrality to that speech.
IDF measures the term's rarity across the two-speech corpus ($N = 2$) using a smoothed formula:

$$\mathrm{IDF}(t) = 1 + ln(\frac{N}{DF(t)})$$

This is the formula when $\mathrm{DF}(t)$ is the number of speeches (one or two) containing the term t. Terms that appear in only one of the two speeches receive the highest weight, amplifying their impact on semantic comparison.

Cosine similarity formula. After vectorization, Cosine Similarity measures the cosine of the angle between the two speech vectors. The result is calculated as:

$$Sim_C(V_D, V_R) = \frac{V_D \cdot V_R}{||V_D \cdot V_R||}$$

The resulting score ranges from 0 to 1.0, where 1.0 indicates highly similar speech content and word usage.

5.3. VADER Sentiment Analysis

VADER (Valence Aware Dictionary and Sentiment Reasoner) is a rule-based sentiment analysis tool originally designed for social media text, though effective for speeches due to its handling of intensifiers. VADER provides four scores for the text as a whole:

- Positive (pos): proportion of text with a positive tone.
- Neutral (neu): proportion of text with a neutral tone.
- Negative (neg): proportion of the text with a negative tone.
- Compound (compound): a single, non-proportional score summarizing overall sentiment strength and direction, ranging from −1 (extremely negative) to +1 (extremely positive).

The use of Term Frequency-Inverse Document Frequency (TF-IDF) weighting is key to isolating distinctive partisan "signals" from the generic linguistic "noise" present in presidential speeches. Politically charged speeches are inherently dense with boilerplate language—high-frequency terms such as "America", "people", and "future" that appear across every speech regardless of the party. A simple word frequency count would result in synthetically high similarity scores, masking the true ideological differences across different candidates. TF-IDF addresses this by mathematically penalizing terms that occur frequently across the speech, using Inverse Document Frequency, while amplifying the terms that are central to the candidate's platform, using Term Frequency, and this results in the Cosine Similarity to reflect a meaningful thematic

alignment and allows the analysis to identify nuanced shifts in how two candidates frame a similar set of issues in the same election cycle.

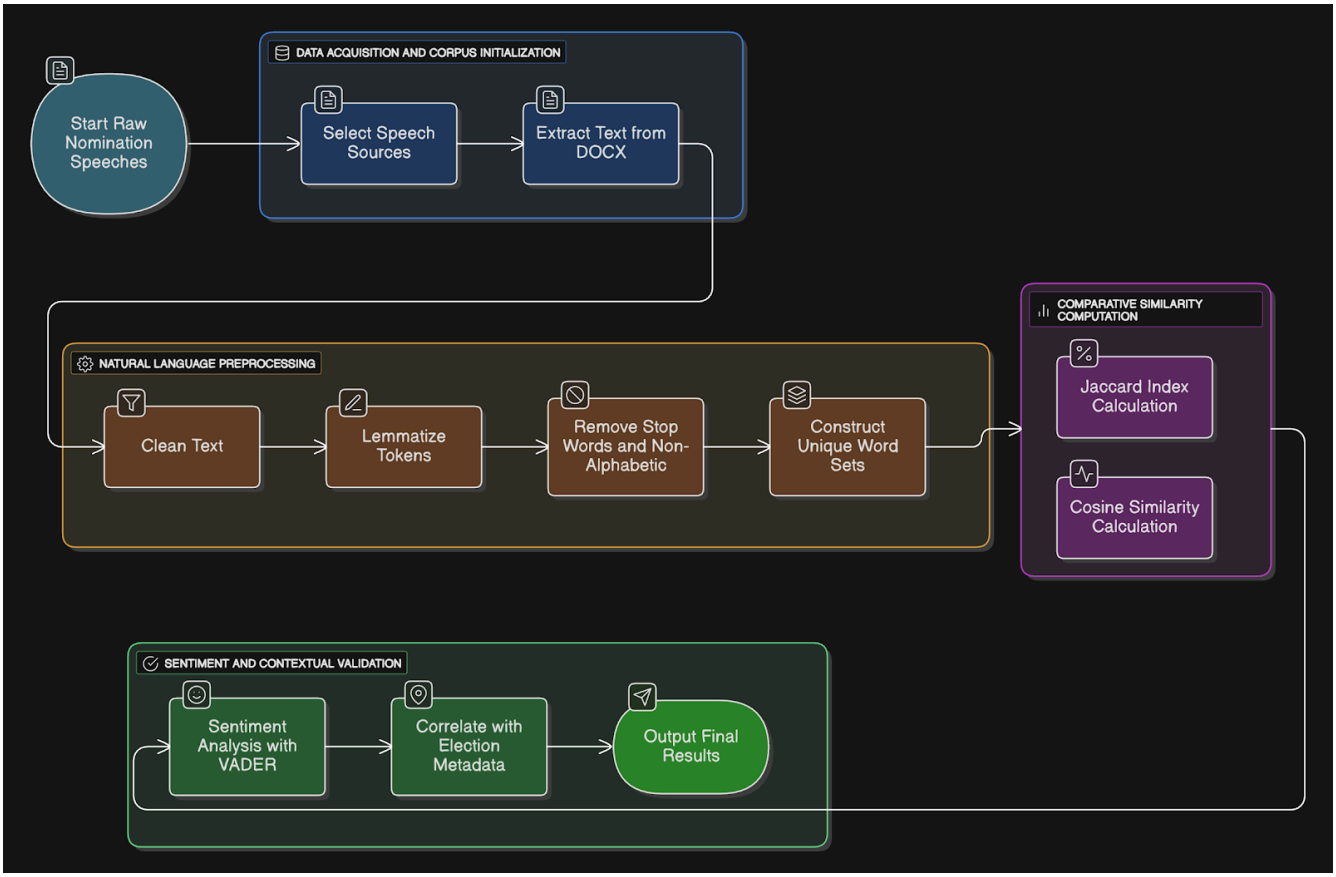

Figure 1: Methodology Flowchart

While the TF-IDF and Cosine Similarity measure the direction of themes, the Jaccard score is used as the second metric to quantify the raw lexical overlap. In the context of political oratories, Jaccard score serves as a proxy for a shared set of vocabulary. By calculating the ratio of the intersection of unique words to their union, it can be analyzed how two opposing candidates in the same election cycle utilize a similar set of lexicons to describe the bigger picture. A high Jaccard score suggests that the candidates are debating on shared issues using a similar set of terms; likewise, a lower score highlights semantic decoupling.

In this study, the key analytical unit is the Election pair cycle. For every four-year interval, the Democrat's speech is directly compared to the Republican's speech. This approach isolates the specific rhetorical climate of each election cycle, which ensures that the scores are not skewed by the evolution of language through the decades. By comparing candidates from each election cycle, this study ensures that the two candidates face the same historical events, this reveals a precise

measurement of "inter-party" divergence.

6. Technical Specifications and Vectorization

To ensure computational reproducibility, the following technical parameters have been applied to the corpus processing:

- Corpus Size and Scope: The dataset consists of exactly 42 presidential nomination acceptance speeches (one Democratic and one Republican per election cycle) between 1944 to 2024. All third-party candidates were excluded to maintain a consistent longitudinal baseline of the primary partisan binary.
- Preprocessing Pipeline: Text ingestion was performed using the python-docx library. Tokenization, case-folding and stop-ward removal was executed using the NLTK (Natural Language Toolkit) English corpus. Furthermore, sentiment scores were calculated at the document level using raw, un-pre-processed text to ensure that VADER's lexicon could leverage punctuation and capitalization intensifiers, which are usually lost during standard lemmatization or stop-word removal.
- Lemmatization: Words were reduced to their base dictionary forms using the WordNet Lemmatizer to ensure that all variations of the same word are treated as a single thematic feature.
- Vectorization and IDF Smoothing: Term weights have been generated using TfidfVectorizer, and applying a smoothed IDF calculation prevented in a zero-weighting for terms that appeared in both documents.
- Synchronous Pairwise Comparison: Importantly, the IDF was calculated per election cycle; this isolated the "rarity" of a particular word to its specific historical moment, preventing modern terminology from skewing the weight of this historical rhetoric.
- Normalization: Document vectors were L2-normalized, which ensured that similarity scores represented the thematic proportion of the speech rather than its length. By mapping each speech onto a unit hypersphere, L2 normalization ensured that the Cosine Similarity measures the angular distance between the two vectors rather than their magnitude. Theoretically, this refocuses the analysis from 'how many times a candidate used a certain word' to 'what proportion of the candidate's total rhetoric effort was dedicated to a particular theme'; consequently, a 2,000 word speech and 6,000-word speech were compared objectively, as the metric identifies the relative density of their thematic priorities rather than quantifying verbosity.

7. Results

This section of the paper presents the empirical findings derived from the analysis of the Democratic and Republican speeches. The core analysis focuses on two comparisons: semantic similarity and emotional valence. The semantic similarity is calculated using the Cosine Similarity of the speeches' aggregated word vectors. The emotional metric is quantified using VADER polarity scores, which capture the emotional valence of each speech. It is important to note that the VADER analysis is conducted on the raw text, whereas the semantic similarity analysis uses lemmatized text.

8. Semantic Similarity

The longitudinal trajectory of the political semantic space shows three distinct epochs categorized by the varying levels of thematic alignment. Across the entire corpus, the mean Cosine Similarity score is 0.4319 (σ = 0.1295), showing a highly dynamic rhetoric landscape marked by substantial periodic shifts in partisan alignment.

Table 1: Syndrome Extraction Table

Epoch	Metric	Slope (β)	Std. Error	p-value	R^2
1944-1960	Cosine	+0.0061	0.0070	0.4494	0.20
	Jaccard	+0.0023	0.0022	0.3741	0.26
1964-1996	Cosine	+0.0012	0.0021	0.5952	0.04
	Jaccard	+0.0016	0.0008	0.0956	0.35
2000-2024	Cosine	-0.0143	0.0053	0.0436*	0.59
	Jaccard	-0.0024	0.0009	0.0401*	0.60

Note: *p < 0.05; **p < 0.01 ; The modern divergence (2000-2024) was further validated using a permutation test (5,000 iterations), yielding a p-value of 0.0256, which confirms the trend is distinct from random variation.

8.1. Epoch 1: Post-War Volatility (1944–1960)

The absolute minimum occurs in 1948 (Truman v. Dewey), with a score of 0.1832—the lowest point on the graph. This reflects maximum thematic divergence, meaning the angle between the two parties' topic vectors was widest, indicating the most dissimilar issue sets in the entire eighty-year span. After 1948, the similarity rose sharply (e.g., 0.4119 in 1956) before falling again, reflecting a highly fluctuating environment as the political center of gravity continued to shift.

8.2. Epoch 2: Thematic Normalization (1964-1996)

This thirty-year period shows a move toward shared thematic alignment. Though scores oscillated (peaking at 0.5369 in 1972), the underlying trend stayed positive. The regression returns a slope of β = +0.0012 for Cosine Similarity. While this shows a gradual thematic alignment, the lower R2 (0.04) suggests that year-to-year events such as the Vietnam War created significant semantic noise around the trendline.

8.3. Epoch 3: Modern Divergence (2000–2024)

The turn of the century shows a fundamental stochastic break. Unlike the previous epochs, this era shows a statistically significant negative trend. The regression for Cosine Similarity yielded a slope of **β = -0.0143, p = 0.0436** and a high model fit (R2 = 0.59). This rate of divergence is nearly three times the magnitude as shown in the second epoch. This confirms that modern polarization is a structured, statistically robust phenomenon classified by the systemic fracturing of shared political language.

To validate the robustness of this modern divergence trend, we implemented a non-parametric permutation test (N = 5,000). By shuffling the similarity indices relative to the temporal axis, we generated a null distribution of potential slopes. The observed slope (β = -0.0143) fell in the extreme tail of this distribution (p = 0.0256), highlighting that the thematic

fracturing of the 21st century is a statistically significant departure from random variation.

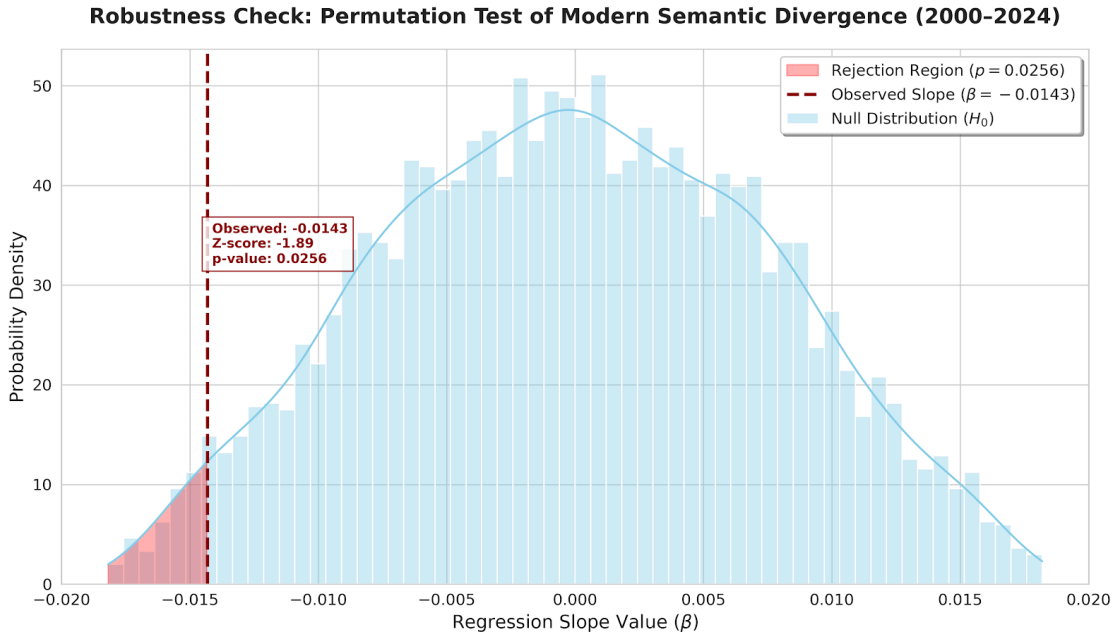

Figure 2: Robustness Check: Permutation Test of Modern Semantic Divergence (2000-2024)

Figure 2 visually substantiates this robustness by mapping the observed regression slope against the simulated null distribution. The red dashed line, showing the empirical slope of the modern era, β = -0.0143, sits on the extreme left tail of the curve, well outside the primary mass of the 5,000 permuted 'random' slopes. The shaded rejection region evidences the p = 0.0256 threshold, giving clear evidence that the current rate of the semantic decay is not an artifact of stochastic noise, but a statistically rare and systemic decoupling of opinionated rhetoric.

9. Comparative Sentiment: Differential Use of Positive vs. Negative Language

The time-series analysis of party-specific emotional trends, quantified using VADER sentiment scores (Figures 3.1 and 3.2), establishes the parameters for differential language use by locating the centroid of emotional scores and assessing temporal volatility.

The emotional rhetoric of the Democratic and Republican Parties, as illustrated in Figure 3.1 and Figure 3.2, shows a highly stable positive differential. The key observation is the structural maintenance of this positive differential across the eighty-year period for all but one speech. The Positive Sentiment line consistently maintains a visible, non-zero distance from the Negative Sentiment line. This universal positivity of the Framing Score indicates a bounded emotional space: the emotional centroid remains anchored in the net-positive quadrant. The absence of cross-overs shows that party communication adheres to a minimum positivity threshold that prevents sustained shifts into negative valence. Although

both Positive and Negative Sentiment lines trend upward—indicating growing emotional variance—the integrity of the positive differential is preserved.

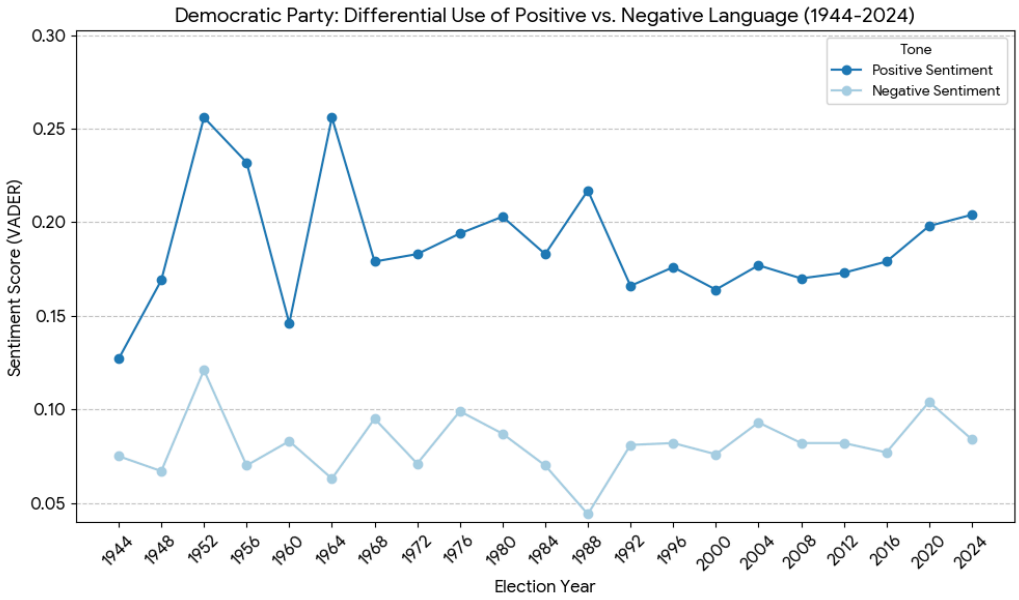

Figure 3.1: Democratic Party: Differential Use of Positive vs. Negative Language (1944-2024)

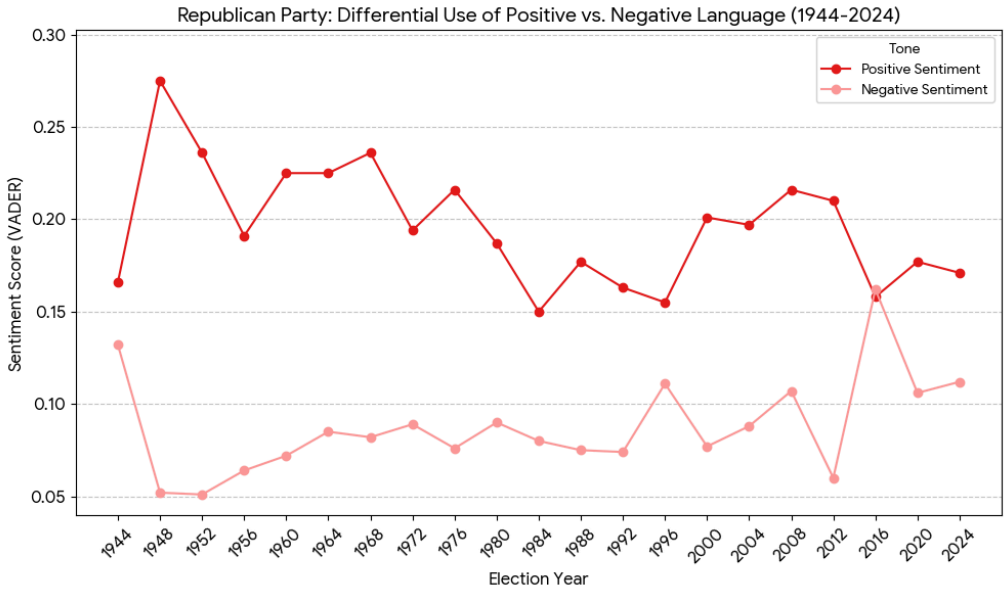

Figure 3.2: Republican Party: Differential Use of Positive vs. Negative Language (1944-2024)

However, the 2016 election cycle marks an exception to this rhetorical constraint. This year shows an ephemeral valence inversion that reduces the stability of the positive differential. The raw VADER scores reveal an atypical rise in Negative Sentiment to 0.162, coinciding with a contraction of Positive Sentiment to 0.158. The brief moment where the Negative score exceeds the Positive score produces a nominally negative Framing Score. Furthermore, the Compound VADER score for this year falls to −0.997, reflecting extreme negative sentiment and demonstrating the party's minimum positive boundary.

The expansion of emotional variance is further elucidated by the distributional analysis shown in Figure 4. By plotting the full corpus as a unified distribution, the structural density of partisan sentiment over the eight-year period can be seen. While the Democratic distribution remains tightly clustered within the high-positive quadrant, the Republican distribution shows a significantly elongated lower whisker.

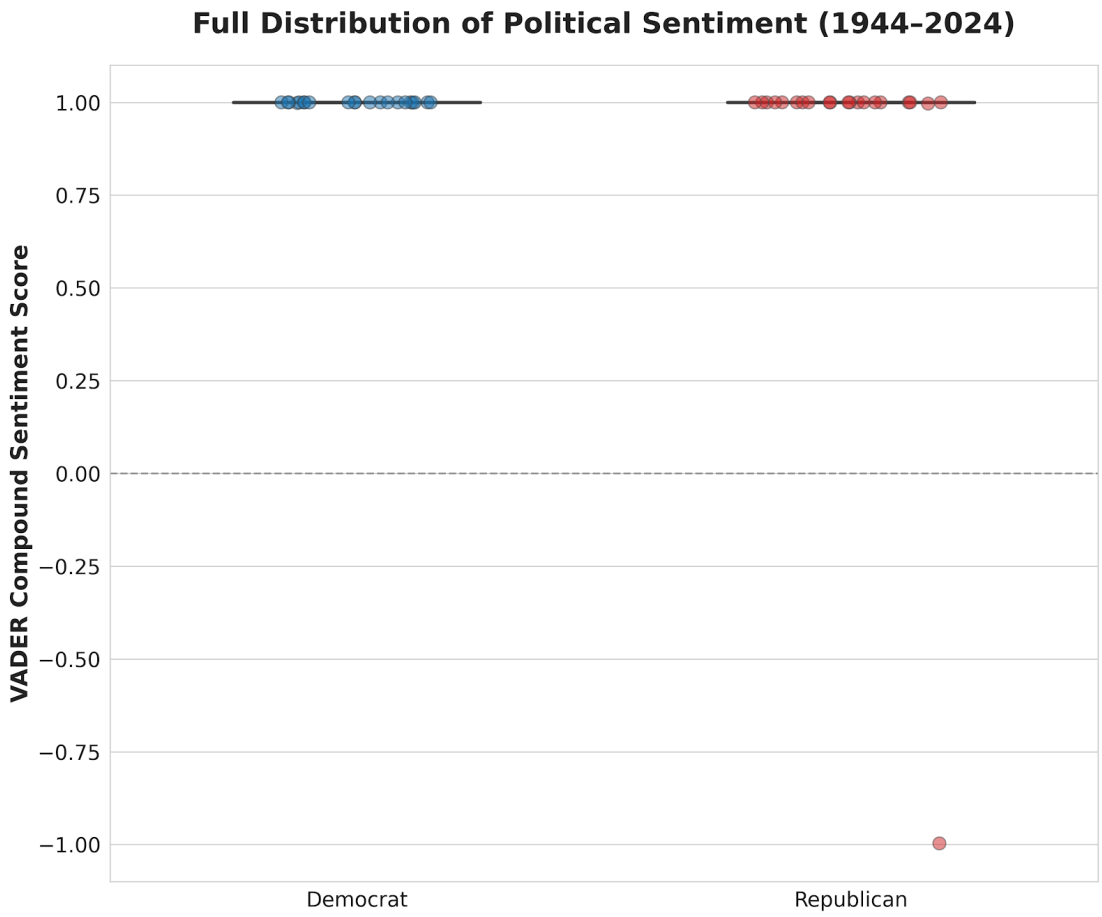

Figure 4: Full Distribution of Political Sentiment (1944-2024)

The visual disparity confirms that the "minimum positivity threshold" has become asymmetric in the modern era. The presence of the 2016 Republican outlier is not just a statistical anomaly but represents the lower bound of an expanding rhetorical range. Mathematically, this score reflects the cumulative density of negative valence across the speech; in VADER's normalized scoring, sustained pessimistic rhetoric in a high-word-count text, the speech naturally approaches the asymptotic limit of -1. While the historical centroid of both parties stays net-positive, the distribution shows that the Republican party successfully de-anchored from the traditional emotional space, allowing for excursions into extreme negative valence that remain absent from the Democratic dataset. By analyzing these scores as a measure of intentional rhetoric framing rather than direct behavioral stimuli, this distribution shows a fundamental shift in permitted emotional boundaries of partisan nomination addresses.

10. Lexical Overlap Measurement: Jaccard Similarity

The analysis of presidential nomination speeches shows a significant fluctuation in raw lexical overlap. By calculating the intersection of unique words, this metric reveals to which extent candidates work within a shared linguistic framework versus isolated one-sided lexicons.

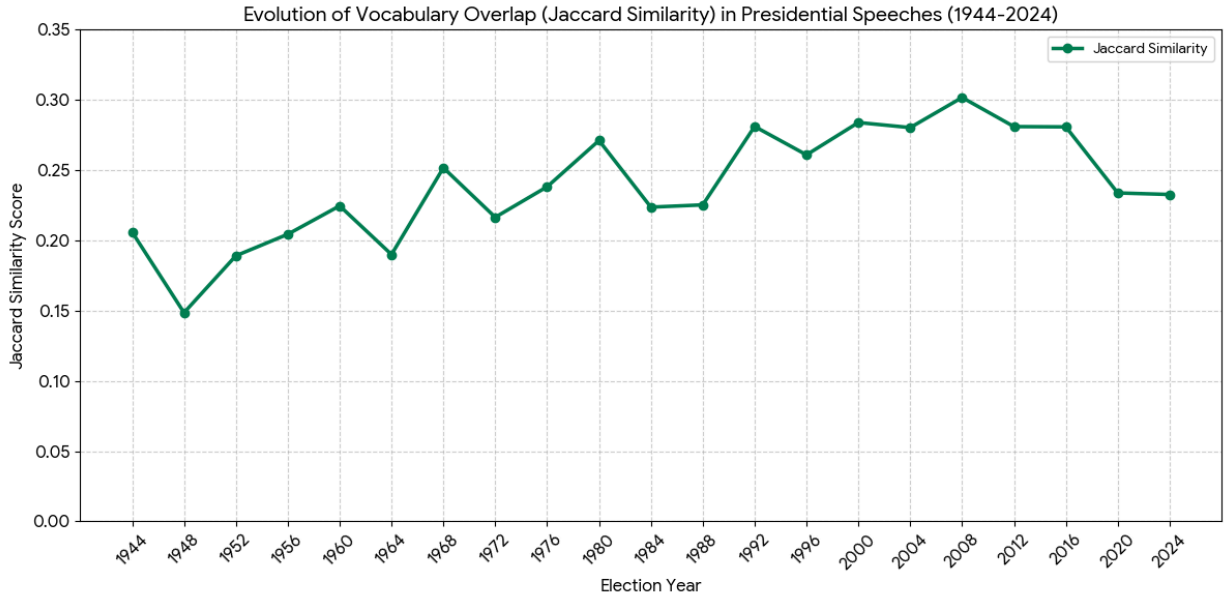

Figure 5: Evolution of Vocabulary Overlap (Jaccard Similarity) in Presidential Speeches (1944-2024)

The 1948 Lexical Floor. The analysis reveals 1948 (Truman vs. Dewey) as the point of maximum lexical divergence across the 80-year corpus. During this cycle, the Jaccard Similarity reached a historic floor of 0.1485. This reveals that the two candidates had a collective unique vocabulary of less than 15%. The rhetoric isolation of this score is highlighted by Truman's aggressive focus on "Eight-Nothin' Congress" and "labor rights", while Dewey's strategy focused on consolidating blue states (at the time) in the Northeast through optimising framing of "unity" and "national progress".

The 2008 Convergence Apex. A distinct reversal in the long-time trend occurred during the 2008 election cycle, where the Jaccard Similarity reached its peak of 0.3016. This convergence was motivated by a high degree of lexical overlap regarding the Great Recession and foreign policy. Particularly, McCain and Obama campaigned extensively in swing states (Florida, Ohio and Pennsylvania) using a more shared vocabulary of "economic crisis" and "reform" to appeal to the median voter,

The data also suggests that the timing of the convention and the location of the speech also acted as variables in terms of the rhetoric distance. Speeches that were delivered later in the election cycle, usually in August or September, tend to show a minimal decrease in the commonality of vocabulary compared to the early-summer addresses. As the election date approaches, the language shifts from a general platform-building to more aggressive contrast-marking. Historically, when conventions took place in critical swing states, there was a visible "thematic pull" that stabilized Jaccard scores as both parties attempted to convey the regional economic concerns. However, the post-2008 data suggests that this effect is gradually fading; candidates maintain their partisan lexicon regardless of the location of the convention, prioritizing

national audiences over regional interests.

The fluctuations in Jaccard scores persist across the observed period, indicating sustained variation in shared vocabulary between the parties. Even in election cycles characterized by relatively high positive sentiment—such as 1956—the proportion of shared unique terms remains low (0.2043). This suggests that affective tone and lexical alignment do not necessarily concur and that periods of rhetorical optimism do not automatically correspond to convergence in issue framing and terminology. While lexical divergence should not be equated directly with ideological polarization, the results indicate the differences in how party priorities are expressed.

11. Discussion

This section of the paper interprets the empirical results of the semantic similarity scores and the emotional valence scores of the Democratic and Republican convention addresses. First, epoch wise explanations of Cosine Similarity scores are illustrated by outlining the political climate of each period, giving brief context on both party platforms, and assessing how closely the nominees' convention speeches align with their respective platforms, thereby explaining their points of convergence or divergence. Second, the results of the Jaccard Similarity are qualitatively validated by interpreting the observed patterns of lexical similarity. Third, the reasons, implications, and limits behind the overall net positive tone of all speeches and the distinct net negative tone of Trump's convention address are deciphered using Figures 3.1 and 3.2.

12. Semantic Similarity

12.1. Epoch 1: Early Volatility (1944–≈1960):

Immediately after World War II, the United States was tasked with transitioning from a wartime to a peacetime economy. This rapid shift—from military production to civilian industry, and from full employment to managing inflation and labor unrest—produced an unstable domestic environment in which political rhetoric lacked consistent framing. At the same time, the emergence of early Cold War tensions with the Soviet Union introduced new foreign-policy priorities that were not uniformly emphasized across party lines. These economic uncertainties, coupled with uneven postwar prosperity and emerging social change, contributed to a fragmented political landscape in which shared thematic ground between parties was limited.

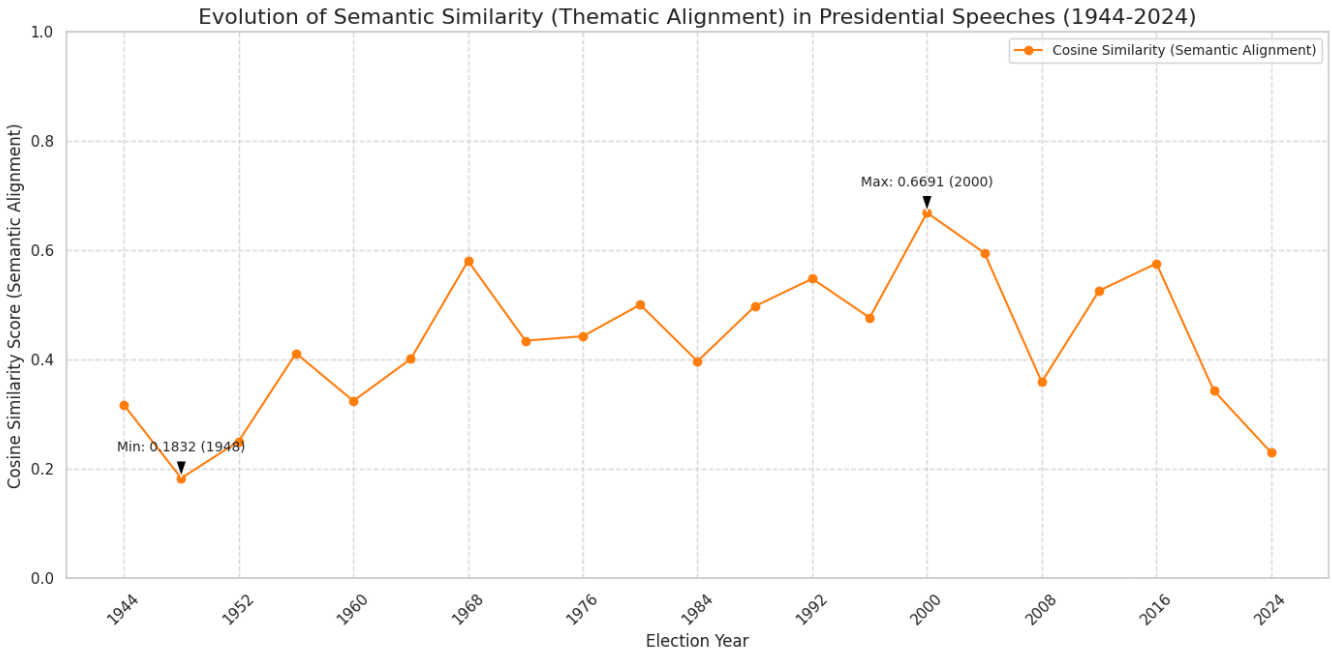

Figure 6: Evolution of Semantic Similarity (Thematic Alignment) in Presidential Speeches (1944-2024)

Democratic nomination speeches during this period placed strong emphasis on domestic critique and reform. Candidates often directly confronted Republican platforms and advocated expansive federal intervention to address issues such as unemployment, housing shortages, consumer protection, and economic instability. The global context was often framed in explicitly moral terms, linking domestic justice to international peace and economic cooperation. These speeches were typically dense with policy detail, outlining specific proposals across a wide range of areas including employment, wages, agriculture, education, civil rights, environmental conservation, and federal aid programs. (Peters & Woolley, n.d.)

Republican nomination speeches, by contrast, relied more heavily on broad themes of leadership, national security, and future optimism. Rather than enumerating extensive domestic policy programs, Republican candidates emphasized abstract ideals such as freedom, responsibility, peace, and national strength. Their rhetoric focused on America's role in the world and its long-term destiny, often prioritizing general principles over concrete legislative agendas. Their platforms in this period similarly articulated commitments to defense, economic growth, conservation, and civil rights in broad, value-oriented language. (The American Presidency Project, n.d.)

These stylistic and thematic differences help explain the pronounced divergence observed in this epoch. Democrats' reliance on detailed reform language introduced a wide array of specific policy themes that were largely absent from Republican speeches, while Republicans' preference for generalized rhetoric centered on unity and strength reduced thematic overlap between the parties. Across individual election cycles, the range and emphasis of topics also shifted. In 1948, Democratic rhetoric foregrounded civil rights, labor issues, and domestic economic concerns, while Republicans

reflected contrasting framing of issues. By 1952, Eisenhower's nomination speech focused heavily on leadership and peace, diverging from policy-heavy Democratic discourse. In 1960, John F. Kennedy's acceptance speech blended a forward-looking vision with global change, once again producing thematic vectors distinct from those of Republican counterparts. (The American Presidency Project, n.d.)

12.2. Epoch 2: Trend Towards Convergence (≈ 1964–1996)

Across the three decades, several core issues consistently appeared in the rhetoric of both major parties, creating a degree of issue-level overlap despite opposing ideological framing. The Vietnam War, in particular, became a central political concern due to its profound domestic impact, elevating foreign policy to a dominant position in national discourse. Civil rights and social equality also emerged as defining issues, especially following the Civil Rights Act of 1964, which accelerated political realignment and forced parties to articulate contrasting positions on race, equality, and voting rights. Alongside these, broader economic and cultural concerns—including domestic welfare and social programs, national security and Cold War strategy, and questions of government reform and public trust—remained persistent elements of political debate. (Peters & Woolley, n.d.)

Despite addressing key areas of discourse, the parties adopted divergent rhetorical and policy stances. During the Vietnam War, democratic platforms increasingly called for de-escalation, peace negotiations, and, in some cases, the end of conscription, with 1968 highlighting significant internal divisions within Democratic rhetoric itself. Republican speeches, by contrast, emphasized law and order, military strength, and a firm approach to foreign commitments, particularly under the leadership of Nixon and Reagan. In response to civil rights agitations, Democrats progressively integrated themes of social justice, anti-discrimination, and expanded political participation into their platforms. Republicans, meanwhile, shifted toward rhetoric centered on states' rights, individual liberty, and market freedom, particularly as conservative leadership consolidated and the Southern Strategy took shape. Across economic and cultural issues more broadly, Democrats framed their arguments around economic security and social protection, whereas Republicans emphasized market opportunity and personal responsibility. (Peters & Woolley, n.d.) (The American Presidency Project, n.d.)

Overall, this epoch exhibits greater thematic similarity than the previous epoch, as both parties shared the similarity of addressing specific national issues even while offering contrasting policies. This shared engagement helps explain the oscillatory pattern observed during these decades: although the specific issues evolved significantly over time, each election cycle featured both parties actively engaging with the same central topics in public discourse.

12.3. Epoch 3: Modern Divergence (2000–2024)

Epoch 3 reflects differences in both core national concerns and in the way parties framed their agendas. Together, these shifts contributed to reduced thematic overlap across 2 decades, despite starting at the point of maximum thematic convergence in 80 years.

Differences across key issues emerged most sharply in the areas of healthcare and cultural rights. Democratic platforms repeatedly placed healthcare access, public health, and social safety nets at the center of their agendas, emphasizing protections for the Affordable Care Act and addressing post-pandemic health challenges in 2020. Republicans, by contrast, moved away from comprehensive healthcare policy articulation, especially in 2020, where they did not release a full new

platform, opting instead for a brief resolution endorsing the incumbent administration's priorities. This structural absence of detailed healthcare policy language reflects a broader shift away from issue-specific framing. Similarly, Democrats expanded the language of social rights over time, particularly with respect to LGBTQ+ equality and civil liberties from 2012 onward, embedding these issues as core components of their platforms. Republican rhetoric increasingly concentrated on cultural and identity-based issues such as border security, immigration enforcement, and law-and-order themes, which became central to party identity in the 2010s and 2020s, including an emphasis on strict immigration control and election integrity. (Peters & Woolley, n.d.)

In other domains, both parties addressed central issues with diametrically opposing views. On economic matters, Republican platforms from Bush through Trump emphasized tax cuts, deregulation, and free-market principles, with later rhetoric linking tariffs and immigration policy to economic nationalism under the "America First" framework. These platforms consistently prioritized lower taxes and a reduced role for government. Democratic platforms, from Gore through Biden and Harris, focused on economic fairness and middle-class security, advocating investment in infrastructure, healthcare, and economic relief, particularly after the 2008 financial crisis and the COVID-19 pandemic. Democratic economic language explicitly connected fiscal policy to equity and social support. In foreign policy, Democrats expressed commitments to international cooperation and alliance-building, including support for global institutions and re-engagement with agreements such as the Paris Climate Accord. Republicans, particularly under Trump, emphasized national sovereignty, border security, and defense priorities framed through an America First lens rather than multilateral engagement. (Peters & Woolley, n.d.) (The American Presidency Project, n.d.)

These stylistic differences were reinforced by contrasting communication strategies. Democratic platforms consistently engaged with a broader and more detailed set of policy issues, while Republican platforms became increasingly compact and selectively focused. This narrowing of issue articulation reduced thematic overlap between the parties, contributing to greater separation in topic space and reinforcing the pattern of modern rhetorical divergence.

13. Quantitative Analysis of Longitudinal Semantic and Lexical Drift

The frequency analysis reveals a significant shift in how both parties construct their speeches. While the lemma "America" stayed the most frequent term across the corpus at 1.34%, its usage density varied depending on the political climate and degree of partisan polarization.

During the mid-20th century, the analysis shows a high degree of thematic overlap, characterized by Cosine Similarity and Jaccard scores. From a computational perspective, this shows that the priority vectors of both the parties were closely aligned. This thematic overlap was likely influenced by existential threats, such as World War II and the onsets of the Cold War, and this resulted in a unified national drive which led to candidates using common vocabulary to describe immediate issues.

Starting in the late 1960s, the results show the beginnings of semantic decoupling. While the Cosine Similarity remained fluctuating, the Jaccard score slowly began minimizing. The divergence highlights a shift in strategy, while still conveying similar vague themes, began utilizing specific, party-based lexicons. This period reflects the transition from a broadcast model of political communications to a more fragmented approach.

Table 2: Thematic Frequency Table (1944–2024)

Era	Key Thematic Phrases (Democrats)	Key Thematic Phrases (Republicans)	Analysis
Post-War (1944-1956)	*Common man*, *labor*, *social security*, *prosperity*	*Spiritual unity*, *free men*, *faith*, *liberty*	Low Jaccard (0.14-0.18): High ideological divergence.
Cold War (1960-1988)	*New frontier*, *great society*, *justice*, *world*	*Peace through strength*, *tax cuts*, *freedom*	Moderate Jaccard: National security acts as a unifying anchor.
Modern (1992-2008)	*Working families*, *healthcare*, *middle-class*, *jobs*	*Small business*, *opportunity*, *mortgage*, *security*	High Jaccard (0.30): High lexical overlap due to shared economic crises.
Current (2012-2024)	*Democracy*, *rights*, *future*, *diversity*	*Make America Great*, *borders*, *strength*, *fight*	Declining Jaccard: Re-emergence of partisan "siloed" language.

In the modern period, both similarity metrics reach lower levels, indicating reduced lexical overlap between party speeches. Within a vector-space framework, this shows greater distance between the parties' term distributions. However, this finding reflects differences in language use instead of ideological extremity, as different vocabularies can express similar concerns, even when phrased in distinct ways.

Nevertheless, the consistency of low similarity scores across several election cycles, regardless of individual candidate style, points to a broader shift in rhetorical patterns. The trend appears to operate rather structurally, suggesting long-term change in how parties frame and present political issues. This reflects sustained lexical divergence, which should be distinguished from claims about voter behavior or ideological polarization.

14. Comparative Sentiment: Differential Use of Positive vs. Negative Language

An analysis of presidential nomination acceptance speeches over the past eighty years shows that nearly all candidates delivered addresses with a net positive emotional tone, with one exception: Donald Trump's 2016 Republican National Convention speech. Four main reasons explain why every other speech conveyed net positive sentiment.

First, nomination acceptance speeches are moments of celebration, gratitude, and party unity. Candidates traditionally begin with expressions of thanks—using phrases such as "I accept your nomination" or "I would like to thank"—which contain lexicon items tagged as positive in VADER. Second, these speeches are designed to be forward-looking. Candidates outline promises, opportunities, and hope, as the primary goal is to inspire and mobilize voters. Third, nominees address the entire nation instead of narrow voter blocs. They emphasize shared values, the common good, and the American Dream, themes that naturally produce positive sentiment in lexicon-based methods. Finally, sustained use of inclusive pronouns such as "we," "our," and "us," alongside words like "proud," "honoured," and "grateful," helps maintain an overall positive emotional profile. (Peters & Woolley, n.d.)

Positive emotional language in political speeches is widely recognized to shape how audiences engage with political messages. Research in political communication and psychology shows that emotional appeals, including positive sentiment, can reinforce interest in political content and contribute to stronger attention and recall of messages (Webster & Albertson, 2022). Studies of emotional messaging also find that positive rhetoric is associated with increased enthusiasm and optimism among audiences, and can encourage greater interest in political discussion and engagement relative to neutral language (Gerstlé & Nai, 2019). When political actors consistently use positive emotional language to communicate priorities and values, it can contribute to a more favorable perception of their message and, by extension, party reputation.

However, positive emotional framing has limitations in contexts where public sentiment is marked by dissatisfaction or unrest. Empirical research indicates that negative emotional messages—especially those invoking fear, anger, or anxiety—tend to attract stronger attention and are more likely to spread widely in political discourse (Schöne, Parkinson, & Goldenberg, 2021). Such findings align with broader evidence that emotional intensity, particularly negative affect, can play a significant role in political communication and engagement patterns, including how people react to political events and interpret political information (Webster & Albertson, 2022). In highly polarized climates, positive rhetoric alone may not resonate with all segments of the electorate, as individuals experiencing frustration or disengagement may be more attentive to emotionally charged negative themes.

By contrast, Donald Trump's 2016 acceptance address showed a clear net negative sentiment, the only instance of its kind in the history of presidential nomination speeches. The dominant tone of his speech was rooted in fear. He framed the United States as being in a state of crisis, repeatedly referencing terrorism, violence, and attacks on police. His use of intense descriptors—such as "brutally murdered," "barbarians," "savage killers," "horrible," "unfair," "disaster," "ruins," and "chaos"—created vivid, violent imagery that contributed to the overall negative emotional score. More importantly, Trump devoted a significant part of his speech in outlining the perceived shortcomings of existing policies and attributing responsibility for the same to the leadership of Democrats. He directly criticized Hillary Clinton, Bill Clinton, and Barack Obama for rising crime, terrorism, immigration problems, violence involving undocumented immigrants, corruption, economic stagnation, unemployment, failing infrastructure, weakened military strength, national-security threats, poor trade deals, foreign-policy shortcomings, and political elitism. Although presidents often highlight systemic challenges to

introduce their own policies, Trump's discussion was marked by a comparatively detailed and direct critique of existing leadership. (Peters & Woolley, n.d.)

The public response to the speech was mixed in both the short and long term. Immediately after the conventions, Trump experienced a larger polling "bump" than Hillary Clinton—his support rose by 3 percent, compared to her 2 percent increase. However, because Clinton was already ahead before the conventions, this translated into only a 1-point net gain for Trump, leaving her still in the lead. (Peters & Woolley, n.d.) A Gallup poll found that after the conventions, voters were 15 percent less likely to support Trump and 4 percent more likely to support Clinton. It was the first time since Gallup began asking the question in 1984 that a candidate left a convention with a net negative effect. (Edwards-Lee, 2016)

Despite these shifts, both candidates ended the 2016 campaign with relatively low favorability ratings. The year produced two of the least liked nominees in modern election history, suggesting that convention speeches did little to reshape voters' deeper opinions. Scholars note that conventions can influence short-term enthusiasm, media narratives, and undecided voters, but long-term turnout and final vote decisions depend on broader factors such as economic conditions, campaign activity, and later events. In 2016, the small convention effects did not meaningfully predict the election outcome. Experts therefore view the speech's direct influence on turnout as limited and overshadowed by subsequent developments. (Norman, 2016)

15. Qualitative Validation: Interpretability Blurbs of Lexical Similarity

To illustrate the 0.3016 Jaccard score identified in the 2008 election cycle, the following excerpts from Barack Obama and John McCain show a significant convergence of lexical priorities. Despite their ideological differences, both candidates have utilized a nearly identical "lexicon of crisis" to show the immediate economic anxieties of the American crowd.

15.1. Snippet A: Barack Obama (Democrat, 2008)

"We meet at one of those defining moments—a moment when our nation is at war, our economy is in turmoil... Tonight, more Americans are out of work and more are working harder for less. More of you have lost your homes and even more are watching your home values plummet. More of you have cars you can't afford to drive, credit card bills you can't afford to pay".

15.2. Snippet B: John McCain (Republican, 2008)

"These are tough times for many of you. You're worried about keeping your job or finding a new one, and you're struggling to put food on the table and stay in your home... We're not going to allow that while you struggle to buy groceries, fill your gas tank, and make your mortgage payment"

Table 3 shows the high-value lemmas that appeared with high-frequencies in both the texts, contributing to the study-wide similarity score.

The record low similarity in 1948, of 0.1485, is the result of two candidates addressing the nation from two completely different perspectives: Dewey from a highly philosophical perspective while Truman having a policy-heavy stance.

Table 3: High-value lemmas from the 2008 election cycle.

Keyword	Obama	McCain
Mortgage	"...job that pays the mortgage"	"...make your mortgage payment"
Home	"...lost your homes"	"...stay in your home"
Work/Job	"...out of work... 23 million new jobs"	"...keeping your job... create new jobs"
Economy	"...economy is in turmoil"	"...rescue our economy"

15.3. Snippet C: Thomas Dewey (Republican, 1948)

"Our people... have a yearning to move to higher ground, to find a common purpose in the finer things which unite us. The unity we seek is more than material. It is more than a matter of things and measures. It is most of all spiritual... We have not yet found the spiritual means to put together the world's broken pieces."

15.4. Snippet D: Harry Truman (Democrat, 1948)

"The Republican Party... favors the privileged few and not the common everyday man... They proved it by the things they did to the people. Prices have gone all the way off the chart... I am calling this Congress back into session to pass laws to halt rising prices, to meet the housing crisis... and an increase in the minimum wage."

While the 2008 high-similarity apex was driven by a common vocabulary of crisis, the 1948 floor is defined by thematic isolation. The candidates did not agree on what the nation's problems were; therefore, this caused them to have a very small intersection of shared word sets, resulting in the low Jaccard score.

16. Limitations And Methodological Constraints

While this study uses a rigorous framework for measuring polarization, several computational limitations must be acknowledged. Firstly, incorporating TF-IDF and Jaccard similarity relies on a "bag-of-words" model, which completely ignores syntax and word order, and most importantly: context. For example, the phrase "I support healthcare reform" and "I oppose healthcare reform" would yield a high degree of lexical similarity while representing completely opposing ideological stances. Second, while VADER Sentiment Analysis is a standard for identifying texts with explicit tones, it will struggle to identify subtle hints of political sarcasm or "dog-whistle" rhetoric, which need a more in-depth understanding than simply rule-based models. Finally, such speeches represent a very specific, formalized genre of political oratory and does not capture the full extent to which polarization occurs which are found in more informal settings, such as social media.

17. Research Scope

Future studies should transition from static vector representations (TF-IDF) to context-based embeddings using Transformer-based architectures such as BERT (Bidirectional Encoder Representations from Transformers). Unlike the current bag-of-words approach, using the BERT architecture will capture the polysemy of the text, allowing researchers to identify how the meaning of the word changes based on the text around it. This would allow researchers to distinguish between shared vocabulary in opposition compared to the shared vocabulary in agreement. This would provide a metric that would capture the intent of the speaker rather than just the lexical frequency.

Furthermore, to identify the migration of political issues, researchers can deploy pipelines that utilize Dynamic Topic Modeling (DTM). While this study showed that parties are diverging, DTM would allow the tracking of specific topic trajectories over a period. This would reveal which topics are of higher interest to one party, such as the Republican "capture" of Border Security, and how the semantic weight would vary across the different election cycles.

Finally, while this paper used VADER for sentiment analysis, researchers in the future could incorporate Affective Computing to measure rhetorical aggression. Utilizing Emotion AI, researchers could classify the texts into more specific categories such as fear, anger or hope; this would allow researchers to determine if the decline in similarity is due to emotional framing instead of the policy substance.

18. Conclusion

This analysis of U.S. presidential election speeches from 1944 to 2024 identifies clear patterns in both thematic alignment and emotional framing across time. The semantic similarity results indicate that political rhetoric has moved through distinct phases: an early period of volatility (1944–1960) marked by sharp fluctuations in issue emphasis, a prolonged phase of convergence (≈1964–1996) during which parties addressed substantially overlapping national concerns, and a modern period of divergence (1996–2024) characterized by rapidly increasing thematic distance. The 1948 election reflects an extreme point of divergence shaped by post-war political, economic, and social uncertainty, whereas the 2000 election illustrates high semantic alignment despite policy differences, demonstrating how shared national priorities can persist during times of economic stability and globalization.

The comparative sentiment analysis shows that presidential nomination speeches have historically maintained a net-positive emotional tone aimed at reinforcing party unity and encouraging public mobilization. Deviations from this pattern, such as Donald Trump's 2016 address, reveal how highly negative, fear-based rhetoric can shift short-term public perceptions without necessarily determining final electoral outcomes. Together, these trends show how political communication balances substantive issue framing with the strategic use of emotion.

Overall, the findings highlight the evolving nature of U.S. political discourse. While parties may converge around core national issues during certain historical moments, the methods through which they frame and address these concerns—both semantically and emotionally—can differ substantially. Understanding these dynamics offers insight into historical electoral outcomes and broader patterns of political polarization and voter engagement in the United States.

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Code and Data Availability

All computational models and custom scripts utilized in this study are hosted in the following public repository: https://github.com/amribanerjee/Political-Polarization-Analysis.

All primary source documents (1944–2024) were obtained via the American Presidency Project at UC Santa Barbara; for reproducibility, the raw text corpus and analysis data are hosted at: https://drive.google.com/drive/folders/1MVaqdSmDhqu9mnt-Yj3Yg_yXPXlS3o0_.

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Author Biography

Amritesh Banerjee is a researcher and programmer with a focus on algorithmic development and technical education. He is the author of the research paper "Python-Driven CT Scan Image Refinement," in which he developed a novel algorithm utilizing Python and Explainable AI (XAI) to enhance the clarity and interpretability of medical imaging. In addition to his research in medical informatics, Amritesh is a published author of the instructional text Introduction to Python Programming, which provides a foundational guide to software logic and syntax. His commitment to the computer science community is further evidenced by his role as a Regional Director for Steel City Codes, where he manages regional operations for providing accessible CS education, and his work as the founder of his school's first programming club. He was recognized for his software engineering skills as a 2nd place winner in the Rochester Institute of Technology (RIT) Software Engineering competition. His work continues to explore the intersection of machine learning, data transparency, and the practical application of AI in real-world systems.

Bhuvi Joneja is a researcher and educational advocate with a focus on constructivist and feminist developments in politics. She is the author of the essay "Can You Be Neutral When You Have Built the Battlefield", published in the International

Affairs Forum, which examines claims of neutrality in former colonial nations through case studies of Britain's stance on Kashmir and France's imperial presence in Francophone Africa. In addition to her research, Bhuvi has published a resource guide on OER Commons, "Ensuring Inclusive Learning for Women: A Practical Implementation Guide," offering alternative educational pathways for socially disadvantaged women. Her commitment to women's education extends to her volunteer work with Aasraa Trust, where, over the course of 10 months, she mentored rural Indian women to advance in their educational goals, helping them gain university admissions and improve their academic performance. She has also explored questions of civic engagement through education and politics as a Civics Unplugged fellow, authoring a case brief on the same with a focus on transient contexts such as Dubai. She aims to major in Politics and International Relations and expand access to education and equitable participation in political and civic life.

Mentor Contribution Statement

Dr. Abhijit Dasgupta provided critical conceptual and methodological oversight throughout the development of this research. His primary role involved advising on the architecture of the Natural Language Processing (NLP) pipeline, specifically guiding the student authors in operationalizing political rhetoric through high-dimensional "text-as-data" methods. Dr. Dasgupta supervised the implementation of TF-IDF vectorization and the application of Cosine Similarity metrics to quantify the semantic distance between partisan corpora. This technical guidance was essential in allowing the authors to isolate distinctive partisan "signals" from general linguistic "noise," ensuring the analysis accurately reflected thematic alignment rather than mere boilerplate language.

Furthermore, Dr. Dasgupta mentored the authors in the selection of Jaccard Similarity as a secondary metric to quantify raw lexical overlap and serve as a proxy for a shared set of vocabulary. He assisted in formalizing the "Election pair cycle" as the key analytical unit, a critical methodological decision that isolated the specific rhetorical climate of each four-year interval and prevented longitudinal language evolution from skewing the results.

Additionally, Dr. Dasgupta supervised the integration of the VADER sentiment analysis tool, helping the authors interpret complex emotional valence scores and identify significant shifts, such as the "valence inversion" observed in the 2016 cycle. Throughout the process, he offered detailed feedback on the structure, clarity, and statistical rigor of the manuscript. While Dr. Dasgupta provided high-level technical and structural guidance, all primary data collection, computational analyses, and writing were ultimately conducted by the student authors.

Mr. Debashish Roy Chowdhury provided unwavering mentorship throughout the development of this research. He guided me in structuring the analysis of cosine similarity scores by elucidating the historical and socio-political context of presidential nomination speeches across different periods. His support allowed me to situate computational findings within patterns of U.S. history.

He also assisted in the interpretation of emotional valence scores derived from the VADER analysis. By clarifying the significance of positive and negative rhetorical framing, he enabled me to identify the underlying factors driving sentiment patterns and articulate their implications within each electoral cycle.

Furthermore, Mr. Chowdhury's oversight ensured that the study remained rigorously anchored in the broader context of U.S. politics. He advised on integrating supplementary analytical dimensions, including speech type, rhetorical strategies,

and party platforms, thereby enhancing the depth of the analysis and reinforcing the study's contribution to understanding the evolution of presidential election rhetoric over eighty years.