

Sociolinguistic Dynamics of Identity: Distinguishing Age-Grading from Language Change in Progress

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ABSTRACT

The intricate relationship between social identity and linguistic variation presents a persistent challenge in sociolinguistics, particularly regarding how speech communities evolve over time. Central to this challenge is the conceptual distinction between age-grading, where individuals systematically alter their linguistic habits across their lifespan, and actual language change in progress, which reshapes the fundamental linguistic norms of an entire community. This paper investigates how slang and specialized linguistic markers serve as crucial indicators of identity, facilitating the intergenerational transmission of cultural and social norms. By bridging established sociolinguistic theories with contemporary computational models of cultural evolution and network dynamics, we propose a comprehensive analytical framework. This framework aims to rigorously disambiguate cyclical lifespan variations from permanent evolutionary shifts in a population's linguistic repertoire. Ultimately, this research provides a methodological foundation for understanding how overlapping generations negotiate identity through the transmission, adoption, and eventual abandonment of localized linguistic markers.

Keyword: sociolinguistic theories, social mechanism, cultural and social norms, sociolinguistics, slang, Susceptible-Infected-Recovered

INTRODUCTION

The study of sociolinguistics has long recognized that linguistic variation is not merely an arbitrary phenomenon, but rather a profoundly social mechanism used to construct and signal identity. Within speech communities, language and slang operate as potent identity markers that continuously undergo intergenerational transmission and modification. A core theoretical necessity in understanding these dynamics is distinguishing between age-grading and genuine language change in progress. Age-grading refers to the phenomenon where individuals adopt specific linguistic behaviors, such as adolescent slang, at certain life stages, only to abandon them as they transition into adulthood, resulting in a cyclical pattern without altering the community's baseline language. Conversely, language change in progress occurs when an innovation is successfully transmitted across generations, fundamentally permanently altering the overarching linguistic system.

Despite the foundational importance of distinguishing these two mechanisms, empirical measurement remains highly complex due to the overlapping nature of social influences and cognitive developments. The problem definition of this paper centers on the necessity of constructing a robust socio-computational methodology that can reliably differentiate temporary age-graded identity markers from enduring linguistic shifts. The scope of our inquiry encompasses both the micro-level social interactions that facilitate linguistic transmission and the macro-level evolutionary forces that dictate the survival or extinction of linguistic innovations. By examining how overlapping generations interact, we aim to map the precise trajectory of slang as it moves from specialized subcultures to mainstream adoption or eventual obsolescence.

Historically, researchers have struggled to empirically isolate these phenomena due to significant methodological limitations. Existing approaches are insufficient for two primary reasons. First, traditional linguistic research

methods often rely heavily on circumstantial evidence, estimating the direction and nature of change merely by analyzing differences between older and younger speakers in cross-sectional data rather than tracking longitudinal transmission (Goel et al., 2016). Second, prior quantitative methods designed to infer evolutionary forces in language change frequently struggle to separate purely stochastic drift from socially motivated selection processes driven by identity signaling (Ahern et al., 2016).

To address these critical gaps in the literature, this paper introduces a novel socio-computational approach. The primary contributions of this paper are defined as follows:

- We propose an integrated computational framework that combines network-based contagion modeling with overlapping-generational theories to mathematically isolate cyclical age-grading from continuous linguistic evolution.
- We outline a comprehensive hypothetical evaluation protocol that utilizes longitudinal digital communication data to empirically quantify the selective forces acting upon slang as a sociolinguistic identity marker.

RELATED WORK

Evolutionary and Dynamical Modeling of Language

The application of evolutionary theory and dynamic systems to linguistics has provided sophisticated mathematical tools for understanding macroscopic language shifts. Researchers have successfully drawn from population genetics to distinguish between broad mechanisms of language change, specifically contrasting stochastic drift with active selection (Ahern et al., 2016). Furthermore, mathematical interaction models, such as variants of the SIR (Susceptible-Infected-Recovered) model, have been deployed to predict the long-term behavior of linguistic dynamical systems and determine whether a language change will be complete or reversible (Fuchs et al., 2024). These evolutionary models excel at identifying selective forces in historical language change, treating variations analogously to biological mutations (Montero et al., 2023).

However, while these macro-level dynamical models are highly mathematically rigorous, they possess notable weaknesses when applied to micro-sociolinguistic phenomena. Their core strength lies in analyzing massive, multi-century corpora to detect broad morphological or syntactic shifts, but they often obscure the granular social contexts and individual identity negotiations that drive short-term slang adoption. Compared to these traditional evolutionary approaches, our work intentionally scales down the temporal focus to examine how localized, identity-driven selection operates across adjacent generations, thereby incorporating the nuanced social dimensions that purely mathematical models frequently omit.

Network Dynamics and Social Contagion

Another critical avenue of research examines language change through the lens of social network analysis and contagion theory. Recent studies utilizing large-scale data from digital platforms have successfully tracked language changes in progress by viewing them as a form of social influence and complex contagion (Goel et al., 2016). These investigations emphasize that densely embedded social ties and specific network structures act as powerful conduits for linguistic influence, particularly concerning novel phonetic spellings and online slang (Goel et al., 2016). This perspective crucially highlights that language change is a highly interactive, socially mediated process rather than a passive, isolated occurrence.

The primary strength of the network dynamics approach is its capacity to capture high-resolution, real-time data regarding how linguistic innovations spread from person to person. However, a significant weakness is that online network studies often lack the longitudinal depth required to definitively prove whether a spreading slang term will permanently alter the language or simply fade as the current demographic ages out of the platform. Our proposed framework directly addresses this limitation by fusing network contagion metrics with explicit age-demographic tracking, allowing us to evaluate whether a widely shared slang term represents a lasting change or merely a temporary, age-graded social performance.

Intergenerational Cultural and Knowledge Transmission

The intergenerational transmission of non-genetic traits—including culture, behavioral norms, and tacit knowledge—provides a vital theoretical backdrop for sociolinguistics. Research has demonstrated that cultural attitudes, such as educational gender gaps among immigrant families, exhibit strong intergenerational persistence from older to younger generations (NoghaniBehambari et al., 2021). Similarly, economic models of knowledge transmission utilize overlapping-generations structures to explain how novices acquire hard-to-codify, tacit expertise by interacting closely with established experts (Ide, 2025). These models emphasize that the structural arrangement of overlapping generations fundamentally dictates the success and fidelity of transmission.

The core idea of applying overlapping-generations models to cultural transmission offers a highly robust theoretical structure for analyzing identity continuity. Its main strength is the explicit modeling of the expert-novice (or adult-youth) dynamic, which is essential for understanding socialization. Its weakness, however, is that these models are typically restricted to economics, education, or professional tacit knowledge, rather than the fluid and often rebellious nature of linguistic slang. Our research adapts this economic and cultural transmission paradigm to sociolinguistics, positing that language change and age-grading can be modeled as varying degrees of intergenerational transmission fidelity, where younger generations selectively reject "expert" linguistic norms to establish distinct cohort identities.

METHOD/APPROACH

To differentiate between age-grading and language change in progress, we introduce a structured socio-computational framework that synthesizes dynamical interaction modeling with overlapping-generations analysis. The core architecture relies on modeling the speech community as a continuous stream of interacting, age-stratified cohorts. By tracking the usage frequencies of specific lexical and syntactic variables across these overlapping cohorts over time, we can quantify the strength of selection driving linguistic innovations (Montero et al., 2023). The system evaluates the transmission pathways of slang terms to determine if their usage remains bounded within a specific age bracket over multiple decades (indicative of age-grading) or if the usage successfully cascades into subsequent age brackets and remains stable as the cohort matures (indicative of language change in progress).

The computational pipeline of our approach consists of the following distinct, numbered steps:

1. **Data Ingestion and Stratification:** Collect longitudinal text data and stratify users into overlapping five-year demographic age brackets.
2. **Linguistic Feature Extraction:** Identify rapidly emerging lexical items, slang tokens, and novel syntactic variations within the corpora.
3. **Network Contagion Mapping:** Map the social interactions among users to calculate tie strength and quantify the complex contagion pathways of the extracted features (Goel et al., 2016).
4. **Transmission and Interaction Modeling:** Apply a variant of the SIR interaction model to the time-series data to compute the critical points of adoption and abandonment for each demographic cohort (Fuchs et al., 2024).
5. **Evolutionary Force Classification:** Utilize inference frameworks to classify the feature's trajectory as driven by stochastic drift, age-specific selection (age-grading), or community-wide selection (ongoing change) (Ahern et al., 2016).

A key design choice in this methodology is the adaptation of the overlapping-generations structure typically used to study the transmission of tacit knowledge (Ide, 2025). Instead of modeling a unidirectional transfer from older experts to younger novices, our model permits bidirectional transmission and intentional rejection. This rationale is vital because sociolinguistic identity markers often emerge from the youth and flow upward, or are deliberately localized within youth cohorts as a mechanism of exclusion. Furthermore, by integrating methods designed to test the strength of selection against a null model of stochastic drift, we ensure that random fluctuations in word frequency are not falsely identified as socially meaningful identity markers (Ahern et al., 2016).

To validate this proposed framework, we outline a hypothetical evaluation plan utilizing a synthetic benchmark dataset. We propose constructing a massive, multi-decade simulated corpus of digital forum and social media

data, spanning a hypothetical 30-year period, with metadata securely tagging user age and geographic location. The evaluation would involve tracking 500 emerging slang terms injected into the dataset with known underlying distributions: half programmed to mimic age-grading (usage drops dramatically as users pass age 25) and half programmed as language change in progress (users retain the term as they age, and subsequent generations adopt it as baseline vocabulary). The framework's efficacy will be measured by its precision, recall, and F1-score in correctly classifying the sociolinguistic nature of these 500 variables against the ground-truth labels.

DISCUSSION

The practical implications of this framework are substantial for both computational linguistics and sociological research. If successfully deployed, this system could allow social scientists to map the real-time evolution of cultural identity markers across vast populations without waiting decades for retrospective census-style linguistic surveys. Furthermore, understanding the precise mechanisms of language change can improve the temporal adaptability of natural language processing systems. By predicting which new slang terms are likely to become permanent fixtures of the language, developers can more efficiently update dictionaries, parsers, and large language models, ensuring that downstream applications do not optimize solely for ephemeral internet trends.

However, this approach is subject to several significant limitations and failure modes. First, there is a severe risk of data sparsity when analyzing highly localized or private slang, as marginalized communities may intentionally obscure their identity markers from public digital spheres. Second, the confounding effects of platform-specific algorithms cannot be ignored; a social media recommendation algorithm may artificially amplify a linguistic variant, mimicking the mathematical signature of complex contagion and selective force, thereby producing false positives. Third, determining the actual offline age of digital users is notoriously difficult, and relying on self-reported metadata or algorithmic age-inference can introduce massive systemic noise into the overlapping-generations model, compromising the core metric of intergenerational transmission.

The ethical considerations and inherent risks of this methodology must be rigorously managed. Primarily, the ingestion and analysis of large-scale digital communication data pose severe privacy risks, as users rarely consent to having their informal, identity-forming conversations utilized for sociolinguistic surveillance. Additionally, there is a profound risk of mischaracterizing marginalized dialects; treating culturally sacred or historically complex linguistic features as mere "slang" or "contagions" can strip them of their cultural dignity and perpetuate academic biases.

Future work should aggressively expand upon the foundational models presented here. One immediate direction for future research is extending the framework into multilingual and code-switching contexts, where the intergenerational transmission of language may be complicated by the cultural assimilation dynamics frequently observed in immigrant communities (NoghaniBehambari et al., 2021). Another critical area for future investigation is the incorporation of multimodal data, specifically audio and video streams, to analyze whether phonetic shifts and visual gestural markers follow the same evolutionary trajectories as text-based digital slang.

CONCLUSION

The distinction between age-grading and language change in progress is a fundamental theoretical pillar of sociolinguistics, essential for understanding how human beings utilize language to forge, maintain, and transmit their social identities. While age-grading reflects the cyclical nature of human maturation and the temporary adoption of specialized slang, true language change requires the successful, permanent transmission of these innovations across overlapping generations. Traditional methods have historically struggled to isolate these phenomena from the background noise of stochastic linguistic drift and imperfect cross-sectional data.

By integrating population genetics, dynamic interaction systems, and network contagion theories, the framework proposed in this paper provides a robust methodology for dissecting these sociolinguistic dynamics. Although challenged by the complexities of digital data validation and algorithmic interference, computational approaches offer unprecedented opportunities to observe cultural evolution in real-time. Ultimately, achieving a precise mathematical understanding of how linguistic identity markers survive or perish will deeply enrich our comprehension of the social fabric that connects sequential generations.

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