ACL Paper Summary

Article Title:
Slangvolution: A Causal Analysis of Semantic Change and Frequency Dynamics in Slang

Author List and Affiliations:
Daphna Keidar, Andreas Opedal, Zhijing Jin, Mrinmaya Sachan
ETH Zürich, Max Planck Institute for Intelligent Systems, Tübingen, Germany

Problem Summary:
The Slangvolution paper presents a unique perspective on language change, with a focus on the evolution of slang, which is known for its informal and often restricted usage within specific groups. The paper delves into the dynamics of semantic change and frequency shift in slang words, as well as their relationship with frequency, polysent (words with multiple meanings), and part of speech.

Through a rigorous causal analysis, the authors of the paper make a significant discovery that challenges traditional assumptions about language change. They find that there is not only an association between semantic changes and frequency shift in slang words, but that slang words actually cause slower semantic changes and more rapid decreases in frequency compared to nonslang words. This finding sheds new light on the unique characteristics of slang as a type of language that undergoes distinct patterns of evolution over time.

Moreover, the authors emphasize the ephemeral nature of slang words, highlighting their tendency to change rapidly in meaning and frequency. To better understand the underlying causal mechanisms driving these changes, the authors utilize causal discovery algorithms, which allow them to estimate the direct causal effect of word type (slang or nonslang) on both semantic changes and frequency shift. This approach provides a more nuanced and rigorous analysis of the dynamics of language change, particularly in the context of slang.

Overall, the paper contributes to the field of linguistics by offering a comprehensive analysis of semantic change and frequency shift in slang words, uncovering the unique characteristics of slangvolution, and utilizing causal discovery algorithms to estimate the direct causal effect of word type on language change dynamics. The findings of this paper advance our understanding of how slang words evolve and shed light on the ephemeral and dynamic nature of language change in informal linguistic systems.

Prior Work:
The paper gives in depth the different methods and work that has been done before. The authors approach the study of language evolution through the lens of casualty, using different casual discovery and inference techniques to show the different distributional factors associated with language changes and how they casually affect it. In *Dumas and Lighter*, they described slang as

an informal part of language that is often used in the connection of a certain setting, where *Mattiello* discusses the important role that slang language plays in enriching the language with neologisms.

The casual methodology for change dynamics helped the authors examine and conclude whether word type does directly influences the semantic changes. The casual discovery method is very useful and gives the example of the paper *Constraint-based method* by Sprites et al, which talks about the methods that use conditional independence test between variables in order to uncover the causal structure, where they rely on global Markov property and the faithfulness assumption. In *Pearl*, causal inference is a commonly used approach in do-calculus, where it denotes "to be the distribution of the outcome Y conditioned on an intervention do(X = x) which forces the treatment variable X to take on the value x." (*Pearl*, 1995). The paper also talks about the casuality for change dynamics, where the authors run casual discovery algorithms, in which the variables in the casual graphs additionally include frequency, polysemy, and POS. The authors learned about the casual graph using e the constraint-based PC-stable algorithm by Colombo and Maathius, where the authors first observe that word type has a direct causal effect on both the semantic change score and the frequency shift, without any confounding from the other variables, they also noted that there is a direct influence of word polysemy on frequency.

Unique Contributions:
The unique contribution of this paper lies in the estimation of the direct causal effect of a word's type (slang or nonslang) on its semantic change and frequency shift dynamics using causal discovery algorithms. The paper utilizes a constraint-based PC-stable algorithm for learning the causal graph, which is a mixed graphical model consisting of both continuous (e.g., frequency) and categorical (e.g., word type) variables. This approach allows for tailored conditional independence tests based on the data types, which is a novel contribution in the field of studying causality in language change dynamics. Additionally, the paper curates a Twitter dataset from two separate time periods (2010 and 2020) to examine semantic change over a 10-year gap, which provides a unique temporal perspective on language change. Finally, the paper also excludes "hybrid" words with both slang and nonslang meanings from the analysis to avoid hardcoded dependencies, and performs a separate analysis of these words in the appendix, demonstrating a comprehensive and thorough approach to studying the causal effects of word type on language change dynamics.

Evaluation Method:
The authors evaluated their work by conducting a thorough evaluation of frequency and semantic shifts in slang words and comparing them to non-slang words. They modeled the data with a causal DAG (graphical representation showing cause and effect between two variables), considering variables that may potentially interact (by including their polysemy, frequency, and part of speech). They discovered there was no influence of confounding variables, nor were there

mediators to explain the relation- confirming a direct effect. Lastly, they compared their results to previous studies and made a note of the limitations in their own study.

Conclusion:
Number of Citations:
- Daphna Keidar: 63
- Andreas Opedal: 7
- Zhijing Jin: 1174
- Mrinmaya Sachan: 1542 (Most Citations)

The authors' work in studying slang and how it evolves is important in many ways. It provides insight into the cultural values and attitudes of the community using the slang. By studying its evolution, we can gain insight into the historical and social contexts in which it was used. Linguists can gain insight into how the language changes over time (and how new words are developed) as well as better be able to capture the cultural context of the language which developed said slang. We think it is important as it helps us communicate with others. In conclusion, this study helps us with our understanding of language, culture, and society and how it develops.