

The Predictive Function of Prenominal Adjectives

Michael Ramscar & Richard Futrell

Stanford University

contact: ramscar@gmail.com



Introduction

Prenominal adjectives are supposed to add to or modify the meanings of head nouns, but this idea is often problematic (Kamp & Partee, 1995; Ramscar et al., 2010). For example, the most frequent adjectives before *puppy* are all redundant:



Before *puppy*:
cute
little
new
...

We propose that prenominal adjectives are used to lower the entropy of informative nouns in context (see Figs. 1 and 2). If this is the case, then we should find that more infrequent nouns are more likely to be preceded by adjectives.

If adjectives are only used to convey meaning, then we expect the opposite: since more infrequent nouns are often more specific, they need to be preceded by fewer modifying adjectives.

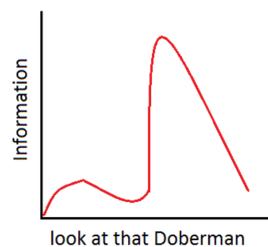


Figure 1. Hypothetical entropy rate with a bare infrequent noun.

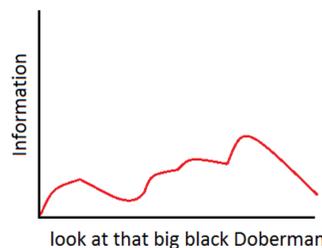


Figure 2. Hypothetical entropy rate with 'redundant' prenominal adjectives.

Study 1: Nouns

Using in COCA (Davies, 2009), we examined the probability of adjectival modification for 20 high-frequency nouns paired with 20 low-frequency nouns of similar semantics.

Results

19 of the 20 lower frequency nouns were more likely to be preceded by an adjective than the corresponding high-frequency noun, $t(19)=4.1312, p<0.001$.

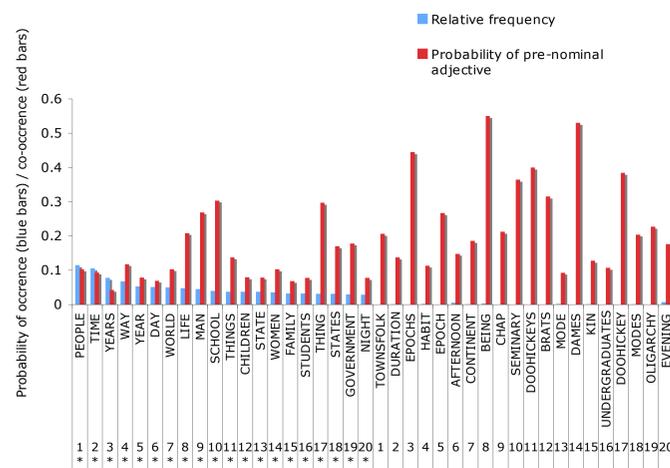


Figure 3. Relative frequency and the likelihood of being preceded by a pre-nominal adjective.

Log frequency and likelihood of pre-nominal 'modification' were negatively correlated, $r = -0.624, p<0.0001$.

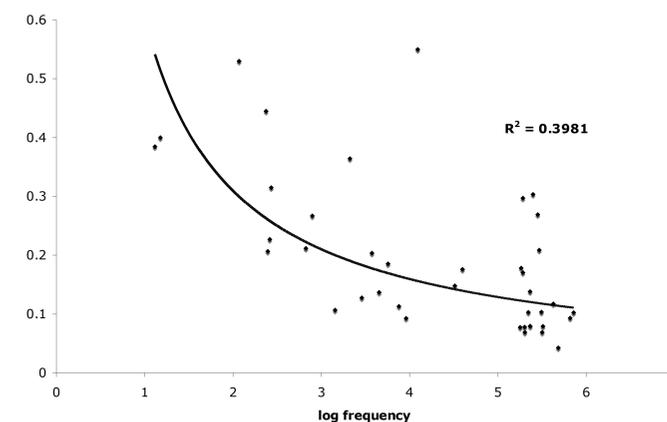


Figure 4. Probability of adjectival modification by log frequency of nouns.

Study 2: Adjectives

We examined the 300 most frequent adjectives in COCA and the distribution of nouns after them. For each adjective *A*, we found the 200 most frequent following nouns. We correlated the log frequency of those nouns with their probability of being modified by the adjective *A*.

Further, we calculated the probability of those nouns being preceded by *the* (i.e. not preceded by any adjective).

Results

For all adjectives examined, there was a negative correlation between $p(\text{following noun})$ and $p(\text{adjective}|\text{following noun})$. The results for *thin* are shown below.

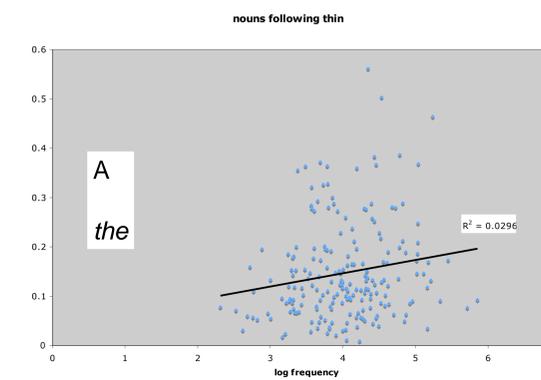
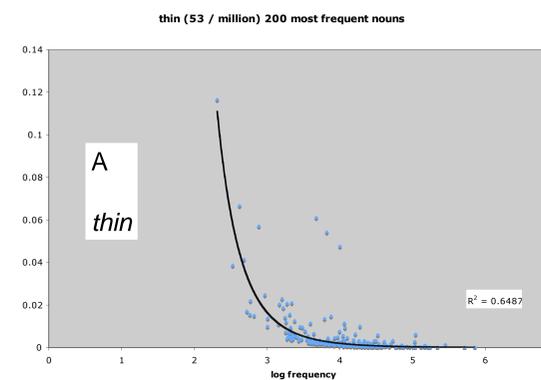


Figure 5. (top) Of the top 200 nouns following *thin*, the probability that they will be preceded by *thin*, by their frequency. (bottom) The probability that those nouns will be preceded by *the*, by their frequency.

An Exception – or a System?

In Futrell & Ramscar (2011) we found that frequent nouns tend to have different gender than their semantic neighbors. Could some adjectives show the same pattern—marking the frequent words in a semantic field?

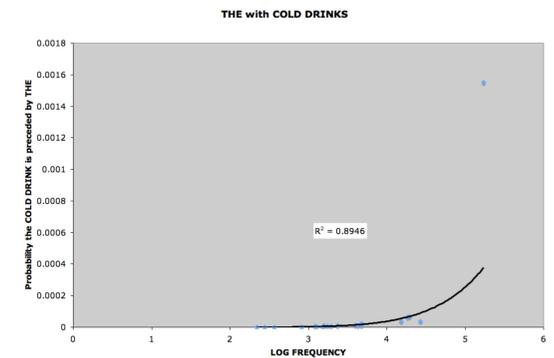


Figure 6. Distribution of *cold* before cold drink nouns.

Cold appears before the frequent cold drinks, allowing for efficient discrimination. Further, the nouns it tends to appear before—*water*, *beer*, and *drink*—are exactly the nouns marked by *das* in German (rather than *der* or *die* for most other cold drinks).

Conclusions

More informative nouns are more likely to appear with adjectives. This doesn't make sense if the function of adjectives is to add detail to meaning. Yet it is perfectly understandable if the function of adjectives is entropy reduction in context (Jaeger, 2010).

Further work should examine the distribution of adjectives in a variety of languages and syntactic positions. Searching for information-theoretic functions has the potential to give a unified description of disparate phenomena (gender, adjectives, noun classifiers, order in naming practices).

Literature cited

Jaeger, T. F. (2010). Redundancy and reduction: Speakers manage syntactic information density. *Cognitive Psychology* 61(1), 23-62
 Kamp, H. and Partee, B. (1995). Prototype theory and compositionality. *Cognition* 57, 129-191.
 Ramscar, M., Yarlett, D., Dye, M., Denny, K., & Thorpe, K. (2010). Feature-label-order effects and their implications for symbolic learning. *Cognitive Science* 34(7), 909-957.
 Davies, M. (2009). The 385+ Million Word Corpus of Contemporary American English (1990-present). *International Journal of Corpus Linguistics* 14, 159-90.

Acknowledgments

We thank Melody Dye and Dan Jurafsky for help and advice.