Interpreting Metaphors using Lessons drawn from Psychology

Daniel Keller
1LILY Lab, Yale University

Introduction

Ever since the field of computational metaphor has started, many researchers have approached the issue from a linguistic viewpoint. Shutova's survey on the computational metaphor field starts with a discussion of linguistic considerations, representing the importance linguistics has had on the field (Shutova, 2015).

A fair amount of work has revolved around conceptual metaphors, but this work has primarily focused on using common linguistic metaphorical mappings such as FEELINGS ARE LIQUIDS ("My anger was stirring within me."). LIFE IS A JOURNEY ("His sudden death was an unexpected arrival at the end of his life.")

This mapping is determined through a study of corpora, and projects that have tried to build corpuses with these annotations have often given little thought to the psychologically processes that lead annotators to assign phrases as metaphorical or literal (Shutova and Teufel, 2010).

A large body of work has also clearly established the importance of metaphors in NLP.

There is a large amount of psychology and cognitive science research on metaphor that often isn't used to motivate computational models of metaphor. There is consensus among cognitive linguists that metaphorical inference is the basis for the use of metaphor (Hobbs 1981; Carbone; 1982; Rohrer 1997; Turner and Fauconnier 2003; Feldman 2006);

however, the study of this inference from the side of psychology has rarely been used. Furthermore, there is a large amount of psychology research that has analyzed how humans understand metaphor. For example, Tversky (1977) went to significant length to model how words metaphorical meanings can often be determined through a feature matching between two words’ bags of features.

This work was motivated by Tversky and Kahneman’s (1973) study of the availability heuristic, a mental heuristic that human minds use that causes us to give unnecessary amounts of the availability heuristic, a mental heuristic that human minds use that causes us to give unnecessary amounts

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Materials and Methods

In this experiment, we used Tversky’s bag of features theory along with Tversky and Kahneman’s availability heuristic to design a model that interprets metaphors. The whole process of the metaphor interpreter can be broken into 2 steps: 1. creation of the bags of features from the corpus, and 2. interpreting metaphors using feature matching. 3.1 Creating Feature Sets

In order to create feature sets, we will use a corpus-based approach. Using the GigaWord corpus, we will count how many times a word is “related" to another word. We will define two words as “related" when one word is the governor and the other word is the dependent in a dependency relation. Dependency parses of sentences are taken from the GigaWord corpus.

Next, we take the 100,000 most frequently occurring words that were tagged as nouns or verbs by the GigaWord Corpus. For each of these words, we find the 100 most “related” words, and add these as a words features. Along with every feature, we give a numerical value determined by the number of times the relation between the two words occurred divided by the number of times the non-feature word occurred. This list of 100 related words will be our best guess at the feature set of the frequently occurring words in question. This is how we build our feature sets.

3.2 Interpreting Metaphors

Once we have built our feature sets, we define the functions that will be used to interpret a metaphor.

In order to interpret a metaphor, we take the top k features in both of the considered words’ feature sets. With each of these top features, we can through the opposing word’s feature set and find the opposing word’s feature with the highest similarity. We then offer up this top feature as a possible interpretation of the metaphor, with a score determined by the value of the top feature multiplied by the similarity of the opposing word’s feature. We then return the n highest or “best” interpretations.

This model is motivated by the availability heuristic. We only check the top k metaphors for any of the words associated with the metaphor since the human mind will only latch onto the first interpretation that presents itself in a given context.

Results

We ran three experiments, all using WordNet to calculate similarity and the NYTimes section of the GigaWord corpus as our corpus for feature extraction. Test metaphors were taken from a small corpus of 84 copular metaphors and their interpreta-tions made by Carlos Roncero and Roberto G. de Almeida (2014). Three trials were run per copula-

Table 1: Results

Conclusion

The results of this experiment were not promising, but there are many reasons that the results could have been decreased through error. Further study into this project is required. While the results of this project may not be a large jumping off point for further study into new areas, it was a wealth of experience for me, and the experience gained here can certainly help me approach other areas in NLP research with faster execution time, more thorough planning, improved background research, and greater independence of design. While I clearly would’ve wanted better results, this project is very much a stepping stone that can be used to inform and direct new research, both through the practice of techniques that should be pursued and techniques that should not be.

Acknowledgement

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