



The Second SFB 1102 PhD Day

Location: Graduate Center (Campus, C9.3)

Date: 18 November 2016

The Second PhD Day for SFB 1102 has six talks lasting half an hour each. Doktoranden are presenting their work before the whole SFB to receive feedback from colleagues they don't usually interact with, providing an opportunity to strengthen their work. The talks focus on the students' work as it relates to their thesis, rather than framing the work solely in terms of a particular SFB project. We look forward to your stimulating questions and thoughtful comments!

PROGRAM

0945 – 1015 Coffee + Breakfast available

1015 – 1030 Welcome

1030 – 1115 David M. Howcroft (A4)

Adaptive Generation: developing natural language generation systems with variation

1115 – 1200 Ekaterina Kravtchenko (A3)

Pragmatic interpretation of informationally redundant event mentions

1200 – 1300 Lunch

1300 – 1345 Mirjana Sekicki (A5)

Cognitive Load in the Visual World: the effect of gaze

1345 – 1430 Mittul Singh (B4)

Leveraging long-span information and complex structures for language modelling tasks

1430 – 1445 Coffee Break

1445 – 1530 Iliana Simova (B5)

Extracting relations across sentence boundaries

1530 – 1615 Simon Ostermann (A3)

Text-Script alignment based on textual similarity measures and ordering information

1615 – 1630 Concluding remarks

Followed by an evening out

Location: Iguana (Mainzer Str. 2, 66111 Saarbrücken)

Time: 19:00 – whenever

Feel free to bring your spouse, children and best friend with you!

Developing novel natural language generation (NLG) systems typically requires a substantial up-front effort. This effort is larger when the desired system needs to include linguistic variation. While the traditional architecture for NLG systems can incorporate non-deterministic approaches to generation, they still require hand-crafted grammars and other generation resources. On the other hand, end-to-end statistical systems require a large corpus and substantial post-processing to improve text quality along dimensions as basic as grammaticality. In this work, I propose a compromise approach which leverages the linguistic knowledge of a traditional surface realization system and Bayesian non-parametric methods for learning a *sentence planning* module.

We use a corpus of restaurant recommendations and comparisons associated with tree structured *text plans*, which include facts about one or more restaurants as well as basic discourse relations between these facts (e.g. *contrast* or *elaboration*). Using OpenCCG, we can parse the corpus into *logical forms* which can be used to regenerate the original corpus. Our task, then, is to learn a tree-to-tree mapping for transforming text plans into logical forms.

In the talk, I will present the current state of these models and my plans for evaluating them, as well as how they relate to project A4's goal of adaptive generation for German.

Work in pragmatics shows that speakers typically avoid stating information already given in the discourse (Grice, 1975; Horn, 1984). However, it's unclear how listeners interpret utterances which assert material that can be inferred using prior knowledge. We argue that informationally redundant utterances can trigger context-dependent implicatures, which increase utterance utility in line with listener expectations (Levinson, 2000). In three experiments, we look at utterances which refer to event sequences describing common activities (scripts, such as 'going to a grocery store').

The first two experiments show that listeners assign informationally redundant event mentions an 'informative' pragmatic interpretation, by reinterpreting the activity in question as relatively atypical in context. Such a (re-)interpretation does not arise for event mentions that are informative either a priori, or in context. The third experiment shows that this effect, however, is substantially tempered when the utterance is not otherwise marked as 'important' or 'relevant.' This shows that the discourse status of an utterance, as indicated by implicit prosody, and independent of utterance content at the word level, can influence the likelihood of it giving rise to a specific pragmatic inference.

Overall, these studies show that explicit mention of highly inferable events may be systematically reconciled with an assumption that a speaker is being informative, giving rise to context-dependent implicatures regarding event 'typicality.' This effect, however, is modulated by the discourse status of the utterance, possibly similar to better-known effects of prosodic focus on implicature generation. The results suggest that excessive informational redundancy of event utterances is perceived as anomalous, and that listeners alter their situation models in order to accommodate it.

These findings raise the question of whether encountering conceptually redundant utterances results in processing difficulty on the part of comprehenders. Current formal models of language processing are, we argue, in principle unable to predict higher 'surprisal,' and hence processing difficulty (Smith & Levy, 2013), for these utterances. Theories of pragmatic processing, however, almost uniformly assume increased difficulty for utterances that (at face value) violate conversational norms (Degen & Tanenhaus, 2015). A pilot eye-tracking reading study suggests that comprehenders do experience difficulty when reading conceptually redundant event descriptions. This suggests that, in order to predict a processing cost associated with conceptually redundant utterances, formal models of language comprehension would need to incorporate some form of pragmatic reasoning.

References

- Degen, Judith & Michael K. Tanenhaus. 2015. Processing scalar implicature: A constraint-based approach. *Cognitive Science* 39(4). 667-710.
- Grice, H. P. 1975. Logic and conversation. In Peter Cole & Jerry L. Morgan (eds.), *Syntax and semantics: Vol. 3: Speech acts*, 41-58. New York: Academic Press.
- Horn, L. 1984. Meaning, form and use in context chap. *Toward a new taxonomy for pragmatic inference: Q-based and R-based implicature*, 11-42. Washington: Georgetown University Press.
- Levinson, S. C. 2000. *Presumptive meanings - the theory of generalized conversational implicature*. The MIT Press.
- Smith, Nathaniel J. & Roger Levy. 2013. The effect of word predictability on reading time is logarithmic. *Cognition* 128(3). 302-319.

Cognitive Load in the Visual World: The Effect of Gaze

Mirjana Sekicki (Project A5)

At the project A5 we have worked on quantifying the role of the visual context in creating predictions about subsequent linguistic content. We have shown that the visual scene with concrete depictions of potential target referents inspires prediction making and results in differences in cognitive load on the relevant referent noun, in cases where no such effect was present with the linguistic context solely. Specifically, the concrete number of potential competitors in a scene has shown to proportionally increase cognitive load on the subsequent linguistic referent.

My current work enriches the visual context by focusing on the gaze cue, as its inseparable part in situated communication. A series of three eye-tracking experiments in the Visual World Paradigm are set to examine the role of the gaze cue in the prediction making process, as well as its subsequent effect on the cognitive load induced by the linguistic referent. The Index of Cognitive Activity (ICA) is used as the measure of cognitive load (associated with surprisal) in addition to the traditional eye-movements analysis that reveals the patterns of anticipatory eye-movements (associated with prediction making).

The questions of whether gaze is considered as part of the context for the subsequent linguistic referent, and whether differences in cognitive load can be detected on the gaze cue itself are addressed by manipulating a) the existence of the gaze cue, b) its congruency with the previous linguistic context, and c) its reliability (i.e. congruency with the following referent noun). Current results show that gaze is evaluated as part of the context, which in case of reliable gaze cue results in the reduction of cognitive load on the linguistic referent.

Inducing Rare-Word Embeddings for NLP Tasks

Mittul Singh(Project B4)

In language modelling tasks, handling rare words like out-of-vocabulary words or words with low frequency forms a key challenge. Due to lack of training data for such words, creating good word representations is difficult. As part of this talk, we introduce a sub-word search based algorithm, harnessing the underlying morphological information, to induce such rare-word representations. These representations can then be utilised in an NLP task. To evaluate these rare-word representations, we apply them to a rare-word-based similarity task, observing results comparable to the state-of-the-art. Moreover, while incorporating these rare-word representations in a log-bilinear language modelling framework, we observe improved rare-word perplexities, with this model outperforming character-aware neural network-based language models on such rare words.

In the field of Information Extraction, Relation Extraction is the task of extracting semantic relationships between entities from natural language texts. These relations can be of various complexities and be expressed in multiple ways. One variation of relation instances we observe is in their encoding density - the same relation can be expressed within a sentence, compressed into a single noun phrase, or spread across several sentences.

In the current work the focus is on the less-densely encoded variations of relation instances which span several sentences. Frequently a relation instance is spread across several sentences through the use of referring expressions. Coreference resolution systems aim at discovering noun phrase mentions referring to the same entity, and could thus be beneficial for the extraction of such relations.

The goal of the current work is to improve and extend an existing relation extraction system to handle such cases. As a first step we explore the usefulness of existing state-of-the-art coreference resolution systems for this task. We perform a detailed error analysis to try to identify weaknesses and strengths of several existing approaches. In a second step we would like to construct a database of paraphrases expressing the same relation with encodings of different densities. This would enable us to study the distributions of variants and phenomena guiding the choice of linguistic encoding.

Scripts are a means to represent world knowledge as partially ordered series of events that describe everyday situations (Schank and Abelson, 1977). People rely on this knowledge when communicating, so script knowledge is rarely made explicit in written text. When we try to model information density and surprisal in natural text, we thus cannot access this script knowledge, because it is not explicitly present in the text. Based on script data that is acquired in project A2, my work in A3 concentrates on identifying script structures in natural text, by aligning script events to event mentions in the text. In the future, this alignment should help to embed script knowledge into the text and thus improve the modeling of information density and surprisal.

In this talk, I will present ongoing work in the task of script-text alignment, in which we try to anchor textual mentions of a script event into the wider script context by automatically assigning a script event type. I will start out with an overview of the script and text resources that have been established up to now and how they are used. Subsequently, I will present 2 different methods that we used to approach the task.

First, we exploited semantic textual similarity measures based on resources as WordNet or Word2Vec to align verb phrases with event paraphrase clusters, i.e. clusters of short, telegram-styled paraphrases describing one event. I will present some first results of these experiments and also talk about possible improvements and combinations of the similarity measures.

Second, we worked on extending the text-script alignment to the discourse context. We did so by formulating the alignment as a sequence labeling problem and then utilizing Hidden Markov Models and Conditional Random Fields. I will give an overview of different types of features that can be used for learning a sequence labeler and also touch on ways of how to incorporate semantic similarities into the sequence models.

The talk will conclude with an overview of possible future extensions, which includes using other, more natural resources for our experiments.

References

Schank, R. C. and Abelson, R. P. (1977). *Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures*. Hillsdale, NJ: Erlbaum.