Enabling Adaptation of Lexicalised Grammars to New Domains

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Abstract
This extended abstract focuses on the main points we will be touching upon during our talk, the aim of which is to present in a concise manner our group’s work on enhancing robustness of lexicalised grammars for real-life applications and thus also on enabling their adaptation to new domains in its entirety.

1 Introduction
At present, various wide-coverage symbolic parsing systems for different languages exist and have been integrated into real-world NLP applications, such as IE, QA, grammar checking, MT and intelligent IR. This integration, though, has reminded us of the shortcomings of symbolic systems, in particular lack of coverage, one consequence of which relates to enormous and sometimes insurmountable difficulties with porting and re-using such systems to new domains. When the hand-crafted grammars which usually lie at the heart of symbolic parsing systems are applied to naturally occurring text, we often find that they are underperforming. Typical sources of coverage deficiency include unknown words, words for which the dictionary did not contain the relevant category, Multiword Expressions (MWEs), but also more general grammatical knowledge, such as grammar rules and word ordering constraints. Currently, grammars and their accompanying lexica often need to be extended manually.

In this talk, we offer the overview to a range of machine learning-based methods which enable us to derive linguistic knowledge from corpora, for instance, in order to solve problems of coverage and efficiency deficiency of large-scale lexicalised grammars, ensuring this way their portability and re-usability and aiming at domain-independent linguistic processing. In particular, we illustrate and underline the importance of making detailed linguistic information a central part of the process of automatic acquisition of large-scale lexicons as a means for enhancing robustness and ensuring maintainability and re-usability of lexicalised grammars.

To this effect, we focus on enhancing robustness and ensuring maintainability and re-usability for two large-scale “deep” grammars, one of English (ERG; [3]) and one of German (GG; [4]), developed in the framework of Head-driven Phrase Structure Grammar (HPSG). Specifically, we show that the incorporation of detailed linguistic information into the process of automatic extension of the lexicon of such language resources enhances their performance and provides linguistically sound and more informative predictions which bring a bigger benefit for the grammars when employed in practical real-life applications.

2 Main Focus Points
In recent years, various techniques and resources have been developed in order to improve robustness of deep grammars for real-life applications in various domains. Nevertheless, low coverage of such grammars remains the main hindrance to their employment in open domain natural language processing. [2], as well as [6] and [7] have clearly shown that the majority of parsing failures with large-scale deep grammars are caused by missing or wrong entries in the lexica accompanying grammars like the aforementioned ones. Based on these findings, it has become clear that it is crucial to explore and come up with efficient methods for automated (Deep) Lexical Acquisition (henceforward DLA), the process of automatically recovering missing entries in the lexicons of deep grammars.

Recently, various high-quality DLA approaches have been proposed. [1], as well as [7] and [5] describe efficient methods towards the task of lexicon acquisition for large-scale deep grammars for English and Dutch. They treat DLA as a classification task and make use of various robust and efficient machine learning techniques to perform the acquisition process.

We use the ERG and GG grammars for the work we present in this talk, for the ERG is one of the biggest deep linguistic resources to date which has been being used in many (industrial) applications, and GG is to our knowledge one of the most thorough deep grammars of German, a language with rich morphology and free word order, which exhibits a range of interesting linguistic phenomena. Thus, the aforementioned grammars are valuable linguistic resources since they provide linguistically sound and detailed analyses of phenomena in English and German. Apart from the interesting syntactic structures, though, the lexical entries in the lexicons of the aforementioned grammars also exhibit a rich and complicated structure and contain various important linguistic constraints. Based on our claim above, in this talk we show how the information these constraints provide can be captured and used in linguistically-motivated DLA methods which we have developed. It has been shown that, comparing...
to statistically treebank-based parsers, parsers based on these hand-written linguistic grammars have more consistent performance over changing of domains [8]. In this we prove our assumption that the linguistic information we incorporate into our DLA methods is vital for the good performance of the acquisition process and for the maintainability and re-usability of the grammars domain-independently, as well for their successful practical application.

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