

# 11-712: NLP Lab Report

Maya Tydykov

April 25, 2014

## 1 Basic Information about Russian

The Russian language is an Indo-European language spoken primarily in Russia and in other parts of the world by approximately 162 million people. It belongs to the Eastern branch of the Slavic language family (Lewis et al., 2013). Russian is a free word order language, although according to (Dryer and Haspelmath, 2013), it is primarily Subject-Verb-Object (SVO). Russian has three genders and six cases, which are marked via suffixes on words. It is written using the Cyrillic script, which was originally created for 9th-10th century Slavic language speakers in order to translate the Bible along with other church texts (“Cyrillic alphabet”).

## 2 Past Work on the Syntax of Russian

A wide range of phenomena concerning the syntax of Russian has been studied in recent years. (Franks, 2005) presents an overview of several issues which have recently been a focused on in the course of these studies. These issues include that of the second dative and nearest conjunct agreement phenomena in Russian. Another subject which has recieved a great deal of attention is that of numerals in Slavic languages. One issue in the domain of Russian syntax that has been studied extensively and that is particularly relevant to the problem of parsing is word order. As mentioned above, Russian allows free word order. However, some orders are prefered over others in neutral situations. Specifically, the neutral ordering of a sentence is generally SVO. Adjectives and demonstratives usually come before the noun they modify, though the order can be changed for various reasons (Bivon, 1971). Adpositions in Russian come before the noun phrase they modify (prepositions)(Dryer and Haspelmath, 2013). There is a large body of work concerning Russian’s free word order, which is referred to as scrambling in literature on syntax. An overview of the most influential works on this subject over the last several decades can be found in (Franks, 2005). Some more recent work on this topic includes (Bailyn, 2008), which questions the existence of scrambling as a way of accounting for free word order and instead proposes that a certain syntactic processes can be used to explain it.

Russian word order has had a significant impact on the prefered methods of parsing. The fact that Russian has free word order, as well as Russian’s rich morphology, make it difficult to parse using a constituency framework because of the increase in the number of rules that would result from such an attempt. Thus, instead of constituency parsing, dependency parsing has been the standard method used for parsing Russian (Skatov et al., 2013). In 2012, the NLP Evaluation forum RU-EVAL held a Russian syntactic parsing evaluation task in which seven dependency parsing systems were evaluated. The purpose of the conference was to get an overview of the current state of the art in parsing for Russian. The top two systems at the conference (ranked by F1-score) were Compreno and ETAP-3, both of which use primarily rule-based approaches (Gareyshina et al., 2012). The third-place parser in the competition, SyntAutom, also a rule-based parser, is an automata-based

system (Antonova and Misyurev, 2012; Gareyshina et al., 2012). According to (Skatov et al., 2013), none of the rule-based parsers evaluated as part of the task are openly available to the public. Another parsing method, implemented in the DictaScope Syntax system, which is itself incorporated into a commercial product, was recently described in (Skatov et al., 2013). This method combines constituency and dependency parsing, attempting to eliminate disadvantages of each.

Few dependency parsers for Russian have been made openly available to the public. One such system is the Russian Link Grammar parser, based on the Link Grammar formalism introduced in (Sleator and Temperley, 1993). This formalism is similar to the dependency structure formalism in that it focuses on creating links between words rather than on grouping words into constituencies. However, the Link Grammar formalism differs in that the links are undirected (i.e., there is no head or child word), links can form cycles, and there is no root word. Another system is Russian Malt, a machine learning system that does not incorporate any rules. This system achieved a score in the RU-EVAL task which would have put it into third place, but did not formally participate in the competition (Sharoff and Nivre, 2011; Gareyshina et al., 2012).

### **3 Available Resources**

### **4 Survey of Phenomena in Russian**

### **5 Initial Design**

### **6 System Analysis on Corpus A**

### **7 Lessons Learned and Revised Design**

### **8 System Analysis on Corpus B**

### **9 Final Revisions**

### **10 Future Work**

## **References**

- Cyrillic alphabet. Encyclopaedia Britannica Online Academic Edition. URL <http://www.britannica.com/EBchecked/topic/148713/Cyrillic-alphabet>.
- A. A. Antonova and A. V. Misyurev. Russian dependency parser syntautom at the dialogue-2012 parser evaluation task. In *Computational Linguistics and Intellectual Technologies*, 2012.
- John Frederick Bailyn. *Word Order and Scrambling*. Blackwell Publishing Ltd, 2008.
- R. Bivon. *Element Order*, volume 7 of *Studies in the Modern Russian Language*. Cambridge University Press, Cambridge, 1971.
- Matthew S. Dryer and Martin Haspelmath, editors. *WALS Online*. Max Planck Institute for Evolutionary Anthropology, Leipzig, 2013. URL [http://wals.info/languoid/lect/wals\\_code\\_rus](http://wals.info/languoid/lect/wals_code_rus).
- Steven Franks. Slavic languages. In *Handbook of Comparative Syntax*, 2005.
- Anastasia Gareyshina, Maxim Ionov, Olga Lyashevskaya, Dmitry Privoznov, Elena Sokolova, and Svetlana Toldova. RU-EVAL-2012: Evaluating dependency parsers for Russian. In *Proceedings of COLING 2012: Posters*, pages 349–360, Mumbai, India, December 2012. The COLING 2012 Organizing Committee. URL <http://www.aclweb.org/anthology/C12-2035>.
- M. Paul Lewis, Gary F. Simons, and Charles D. Fennig. *Ethnologue: Languages of the world*, seventeenth edition. Web, 2013. URL <http://www.ethnologue.com/statistics/size>.

- Serge Sharoff and Joakim Nivre. The proper place of men and machines in language technology processing russian without any linguistic knowledge. In *Computational Linguistics and Intellectual Technologies*, 2011.
- Dan Skatov, Sergey Liverko, Vladimir Okatiev, and Dmitry Strebkov. Parsing russian: a hybrid approach. In *Proceedings of the 4th Biennial International Workshop on Balto-Slavic Natural Language Processing*, pages 34–42, Sofia, Bulgaria, August 2013. Association for Computational Linguistics. URL <http://www.aclweb.org/anthology/W13-2406>.
- Daniel D. Sleator and Davy Temperley. Parsing English with a link grammar. In *Proc. Third International Workshop on Parsing Technologies*, pages 277–292, 1993. URL <http://www.cs.cmu.edu/afs/cs.cmu.edu/project/link/pub/www/papers/ps/LG-IWPT93.ps>.
- S. Ju. Toldova, E. G. Sokolova, I. Astaf’eva, A. Gareyshina, A. Koroleva, D. Privoznov, E. Sidorova, L. Tupikina, and O. N. Lyashevskaya. Nlp evaluation 2011-2012: Russian syntactic parsers. In *Computational Linguistics and Intellectual Technologies*, volume 2, 2012.