# How extra-linguistic factors affect pronunciation variation in different speaking styles

Barbara Schuppler[1]

[1]Signal Processing and  Speech Communication Laboratory, Graz University of Technology, Austria

*b.schuppler@tugraz.at*

*Research question:* For the varieties spoken in Germany a lot of attention has been given to the study of pronunciation variation and reduction (e.g., Adda-Decker, M. & Lamel, L., 2000). For Austrian German, however, studies have been limited to prepared speech as spoken by trained radio speakers on the one hand and to very specific local dialects on the other hand. Only recently, we have collected read speech, elicited speech, and free conversations spoken by 38 speakers originating from the main cities of Austria (Schuppler et al., 2014). The aim of the current study is to investigate which extra-linguistic factors affect certain phonological- and reduction rules and whether their effect depends on the speaking style.

*Materials and Method:*  Our preliminary results are based on 22 260 tokens from 12 speakers extracted from the Graz Corpus of Read and Spontaneous Speech (GRASS). For the final paper submission, this study will be based on in total more than 65 000 word tokens from 38 speakers. GRASS was manually transcribed on the orthographic level and automatically annotated with phonetic transcriptions by means of a forced alignment and a burst detector (Schuppler et al., 2014b). Based on these transcriptions, we analyze the distribution of 18 phonological- and reduction rules typical for standard Austrian German (e.g., vowel substitution/a:/ > /o:/, consonant lenition /b/ > /v/, etc.). For this purpose, we build mixed effects logistic regression models with speaker and word as random variables (Jaeger, 2008).

*Preliminary Results:*  Based on 22 260 tokens from 12 speakers, we observed that pronunciation variation is in general more pervasive in read (33.1 %) than in conversational speech (63.2 %). This result is as expected. For certain rules, however, we observed no significant differences in frequency of occurrence between the speaking styles (e.g., devoicing of fricatives, vocalization and deletion of /r/). With respect to the extra-linguistic variables, we observed in general significant effects of age in all speaking styles and of social and regional background in the conversational speech. Our detailed analysis for each of the rules, however, showed a more complex picture of dependencies.

*Conclusions:*  This study presents the first quantitative analysis of pronunciation variation in Austrian German and reports which extra-linguistic factors affect the kind of variation observed. The presented methods for modeling pronunciation variation will be incorporated into an Automatic Speech Recognition (ASR) system.

**References:**

Adda-Decker, M. & Lamel, L. (2000). Modeling reduced pronunciations in German. *Phonus 5*, Institute of Phonetics, University of the Saarland, p. 129-143.

Jaeger, T.F. (2008). Categorical data analysis: Away from ANOVAs (transformation or not) and towards logit mixed models. *Journal of Memory and Language, 59*, pp. 434–446.

Schuppler, B., Hagmueller, M., Morales-Cordovilla, J. A. & Pessentheiner, H. (2014). GRASS: The Graz Corpus of Read and Spontaneous Speech. *Proceedings of the 9th International Conference on Language Resources and Evaluation (LREC'14),* Iceland*,* pp. 1465-1470.

Schuppler, B., Grill, S., Menrath, A. & Morales-Cordovilla, J. A. (2014). Automatic phonetic transcription in two steps: forced alignment and burst detection. Accepted for presentation at 2nd *International Conference on Statistical Language and Speech Processing (SLSP'14),* Grenoble*,* France.