Automatic classification of lexical stress errors for German CAPT

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SLaTE 2015, Leipzig
4 September 2015

Lexical stress [TODO (LS)] in German

Accentuation/prominence of syllable(s) in a word

In German:

- Variable placement, contrastive function

  um·FAHR·en vs. UM·fahr·en
  to drive around *to run over*

- Reflected by duration, fundamental frequency (F0), intensity[1]
- Impacts intelligibility of non-native (L2) speech[2]

[1] Dogil and Williams 1999.
[2] Hirschfeld 1994.

CAPT for lexical stress errors [TODO (LSEs)]

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- Contrastive LS notoriously difficult for French speakers[1]
- CAPT offers huge potential for individualized instruction

- Automatic detection of LS errors in L2 German unexplored
- Recent work shows promising results using machine learning for classification of English stress patterns[2]

Our goal: explore classification-based detection of lexical stress errors by French learners of German

[1] Dupoux et al. 1997.

[2] Kim and Beutnagel 2011.

Data

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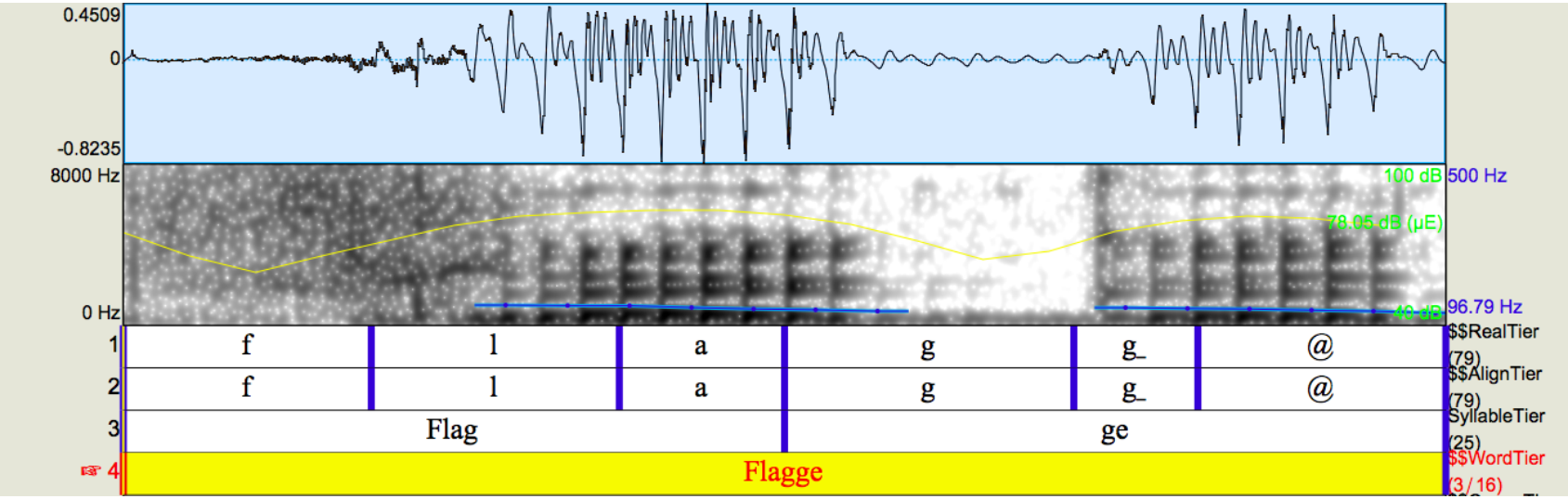
Subset of IFCASL corpus of French-German speech[1]

[TODO new screenshot]



- 12 bisyllabic, initial-stress words (word types) extracted automatically
- 668 tokens from ∼55 French speakers

[1] Fauth et al. 2014.

Data annotation

- Each token assigned a class label:

  3 stress classes:
  [correct], [incorrect], [none]

  2 error classes:
  [bad_nsylls], [bad_audio]

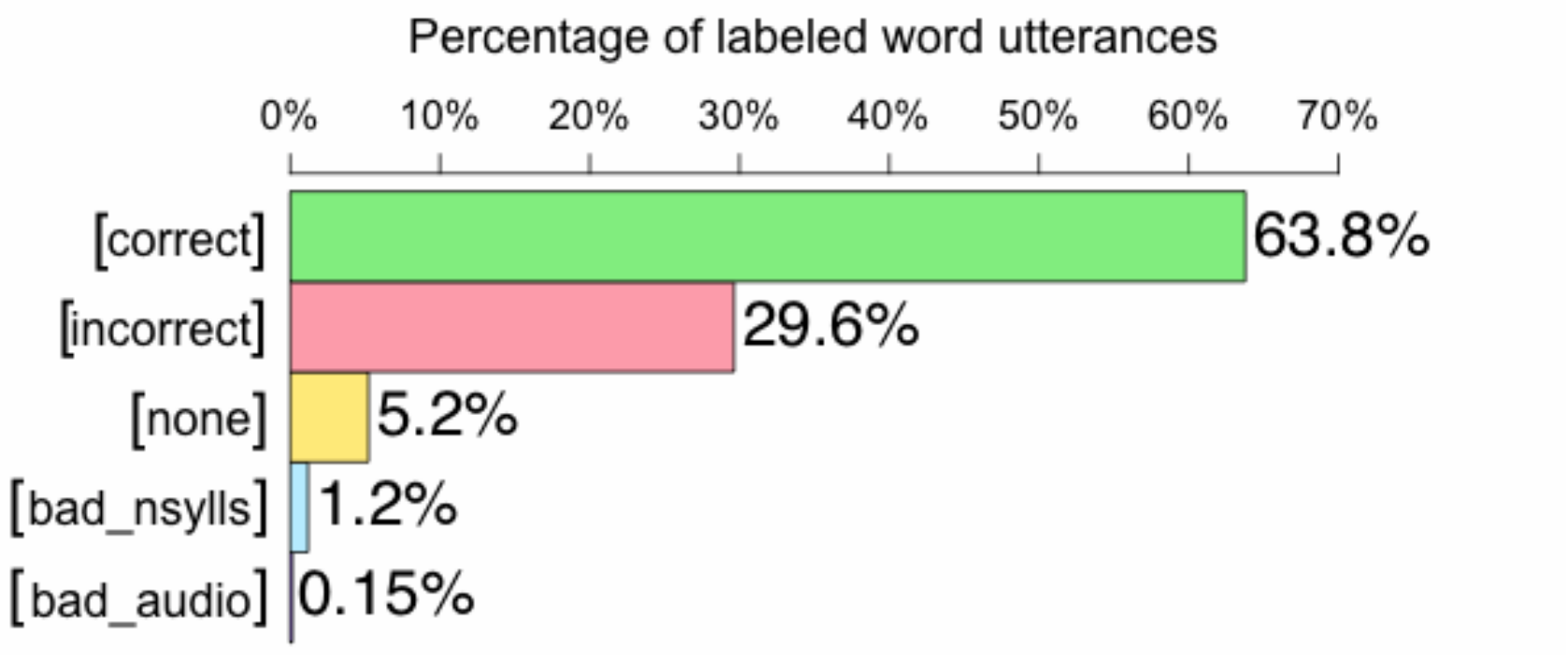
- 15 annotators (12 native), each token labeled by $\geq$2

Overall pairwise inter-annotator agreement

	Mean	Maximum	Median	Minimum
% Agreement	54.92%	83.93%	55.36%	23.21%
Cohen's κ	0.23	0.61	0.26	-0.01

- Variability not explained by L1 or expertise
- Single gold-standard label selected for each token

Data annotation results



Selected references

- G. Dogil and B. Williams. “The phonetic manifestation of word stress”. In: *Word Prosodic Systems in the Languages of Europe*. Ed. by H. van der Hulst. Walter de Gruyter, 1999. Chap. 5, pp. 273–334.
- E. Dupoux, C. Pallier, N. Sebastian, and J. Mehler. “A Destressing ‘Deafness’ in French?” In: *Journal of Memory and Language* 36.3 (Apr. 1997), pp. 406–421.
- C. Fauth, A. Bonneau, F. Zimmerer, J. Trouvain, B. Andreeva, V. Colotte, D. Fohr, D. Jouvet, J. Jügler, Y. Laprie, O. Mella, and B. Möbius. “Designing a Bilingual Speech Corpus for French and German Language Learners: A Two-Step Process”. In: *9th Language Resources and Evaluation Conference (LREC)*. Reykjavik, Iceland, 2014, pp. 1477–1482.
- U. Hirschfeld. *Untersuchungen zur phonetischen Verständlichkeit Deutschlernender*. Vol. 57. Forum Phoneticum. 1994.
- Y.-J. Kim and M. C. Beutnagel. “Automatic assessment of American English lexical stress using machine learning algorithms”. In: *SLaTE*. 2011, pp. 93–96.