

Automatic diagnosis and feedback for lexical stress errors in non-native speech: Towards a CAPT system for French learners of German

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Some syllable(s) in a word more accentuated/prominent¹

um·FAHR·en	vs.	UM·fahr·en
<i>to run over</i>		<i>to drive around</i>

- ▶ German: variable stress placement, contrastive stress¹
- ▶ French: no word-level stress, final syllable lengthening²

Goal: Computer-Assisted Pronunciation Training (CAPT) for lexical stress errors for French learners of German

¹A. Cutler. "Lexical Stress". In: *The Handbook of Speech Perception*. Ed. by D. B. Pisoni and R. E. Remez. 2005, pp. 264–289.

²M.-C. Michaux and J. Caspers. "The production of Dutch word stress by Francophone learners". In: *Proc. of the Prosody-Discourse Interface Conference (IDP)*. 2013, pp. 89–94.

Motivation

Lexical stress errors by French learners of German

- Annotation of a learner speech corpus

- Inter-annotator agreement

- Frequency of errors

Error diagnosis

- Word prosody analysis

- Diagnosis by comparison

- Diagnosis by classification

Feedback

- Implicit

- Explicit

- Self-assessment

The de-stress CAPT tool



Criteria for selecting errors to target in a CAPT system.

Lexical stress errors seem to be:

- ▶ Frequently produced by French learners of variable-stress languages^{1,2}
- ▶ More important for intelligibility in L2 German than other types of errors³
- ▶ Possible to identify automatically by comparison¹ or classification⁴

¹A. Bonneau and V. Colotte. “Automatic Feedback for L2 Prosody Learning”. In: *Speech and Language Technologies*. Ed. by I. Ipsic. InTech, 2011.

²M.-C. Michaux. “Exploring the production and perception of word stress by French-speaking learners of Dutch”. In: *Workshop on Crosslinguistic Influence in Non-Native Language Acquisition*. 2012.

³U. Hirschfeld. *Untersuchungen zur phonetischen Verständlichkeit Deutschlernender*. Vol. 57. Forum Phonetikum. 1994.

⁴Y.-J. Kim and M. C. Beutnagel. “Automatic assessment of American English lexical stress using machine learning algorithms”. In: *SLaTE*. 2011, pp. 93–96.

- ▶ How reliably can human annotators identify errors in learner utterances?
- ▶ How frequently are errors actually produced by French learners of German?

Data: IFCASL corpus of French-German L1/L2 speech¹

- ▶ German utterances by French and German speakers
- ▶ Word- and phone-level segmentations (syllable level added automatically)
- ▶ Selected 12 word types (bisyllabic, initial stress)
- ▶ Dataset: 668 word utterances by 55-56 speakers

Annotators (15 in total):

- ▶ L1: 12 German speakers, 2 English, 1 Hebrew
- ▶ Expertise: 2 Experts, 10 Intermediates, 3 Novices
- ▶ Annotated 3 word types in 1 ~15 min. session

¹C. Fauth et al. “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.

tragen

526

play word

play sentence

stress is on CORRECT syllable

stress is on INCORRECT syllable

no clear stress / I can't tell

wrong number of syllables

problem with audio

1 / 168

Praat annotation tool

tragen

526

play word

play sentence

[correct]

stress is on CORRECT syllable

[incorrect]

stress is on INCORRECT syllable

[none]

no clear stress / I can't tell

[bad_nsylls]

wrong number of syllables

[bad_audio]

problem with audio

1 / 168

Praat annotation tool

[TODO]



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