# A CAPT tool for training and research on lexical stress errors in German

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## Overview

de-stress: the German (de) System for Training and Research on Errors in Second-language Stress [1] is a prototype Computer-Assisted Pronunciation Training (CAPT) tool aimed at native French speakers learning German as a foreign language. The tool targets lexical stress errors (e.g. stressing the wrong syllable in a given word).

The modular design of de-stress incorporates various methods for diagnosing and presenting feedback on these errors, as described below. Both instructional and research applications have motivated the tool's development:

- Learners can receive feedback without human instructor
- Teachers can create exercises matching individual student needs
- Researchers can study efficacy of various diagnosis/feedback types

Once more is known about which diagnosis/feedback types are most effective in which situations, this tool could become a useful component of an intelligent CAPT system (see fig. 1).

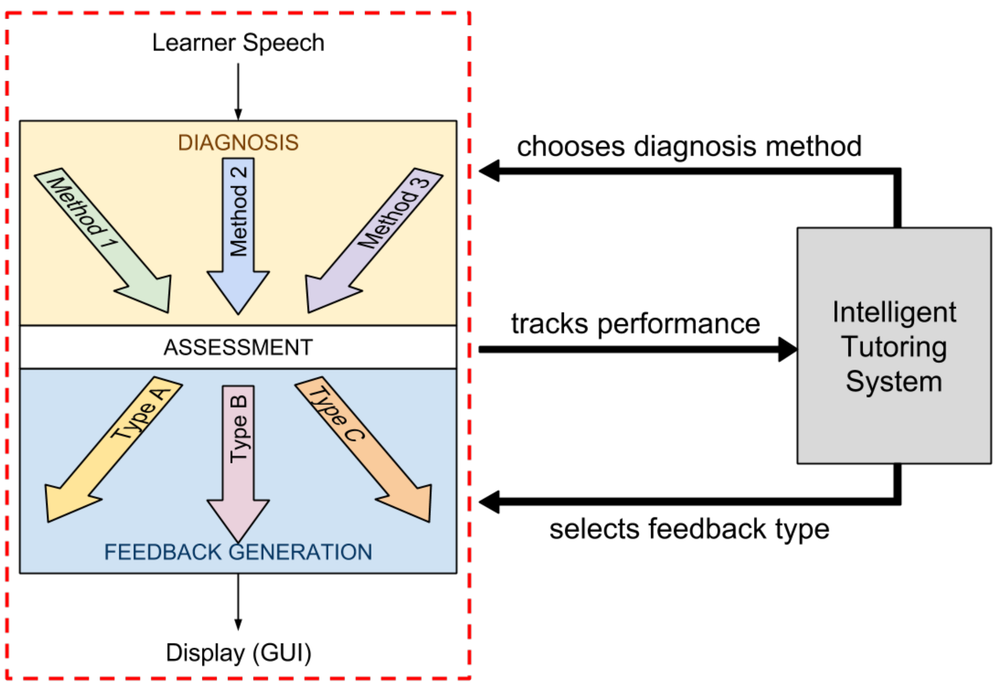


Figure 1: Conceptual diagram of de-stress (within dashed line) and its possible function in the context of an Intelligent Tutoring System (ITS).

## Error diagnosis

A simple web interface presents a learner with a German sentence to read aloud, with one word highlighted as the target for that exercise. The learner submits an utterance of the sentence for assessment. The learner's realization of the target word's lexical stress pattern is diagnosed via one of the following options:

- Classification using machine learning [2]. Possible feature sets:
  - Syllable-level prosodic features (extracted with JSnoori [3]):
    - Duration
    - Fundamental frequency (F0)
    - Intensity
  - Word uttered
  - Speaker age/gender/proficiency
- Comparison to reference (native-speaker) utterance(s). Options:
  - One-to-one learner-to-reference comparison using JSnoori [3]
  - One-to-many comparison (averaging one-to-one results)
  - Manual reference selection by either instructor or student
  - Automatic reference selection based on F0 mean and range

## Feedback delivery

Based on the error diagnosis, one or more of the following types of feedback are presented to the learner via the web interface.

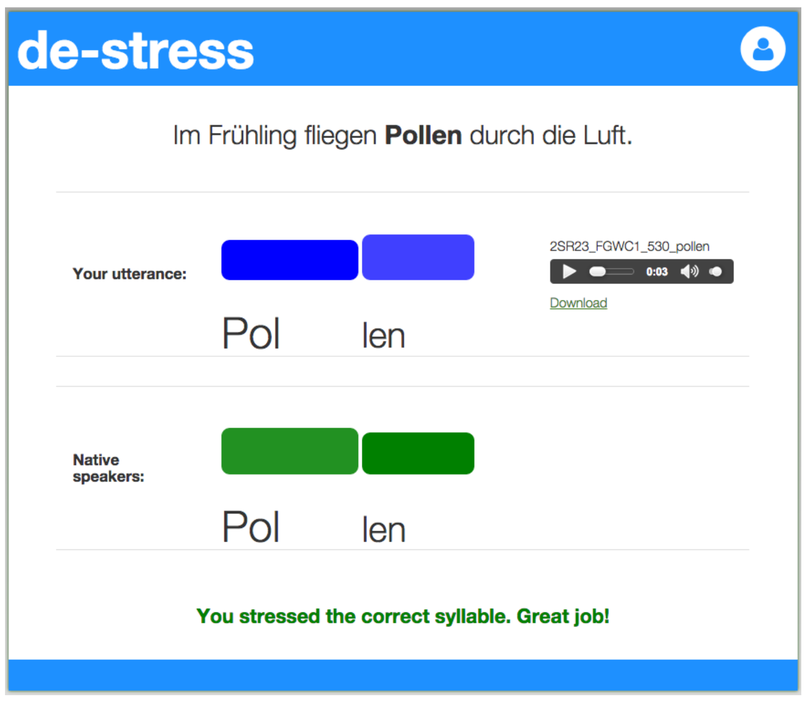


Figure 2: Feedback via graphical visualization (blue/green rectangles), text stylization (syllable text below rectangles), and verbal message (green text).

- Explicit feedback:
  - Verbal error/success messages (see fig. 2)
  - Graphical "skill bars"

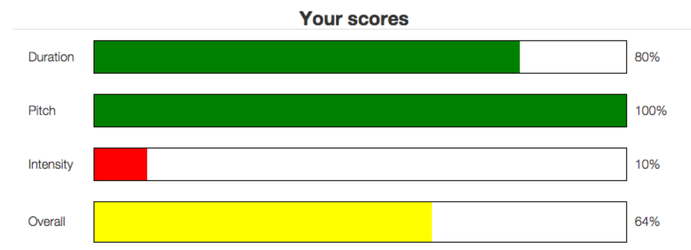


Figure 3: Feedback via skill bars.

- Implicit feedback (see fig. 2):
  - Graphical visualization of syllable prosody
  - Text stylization reflecting syllable duration
- Self-assessment questionnaire for learner to complete

## Administrative interface for teachers/researchers

An administrative interface allows a language teacher or CAPT researcher to create new exercises for students to complete. Each exercise features a specific combination of the various diagnosis and feedback options described above.

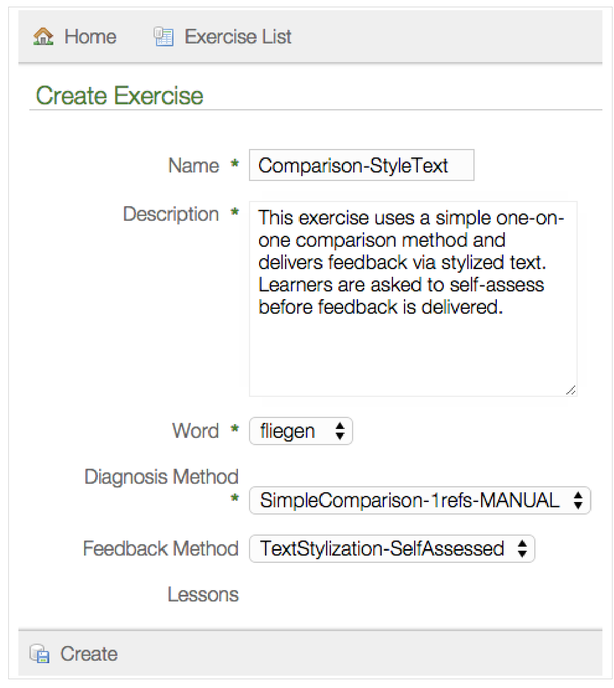


Figure 4: Admin. interface for creating a new exercise combining specific diagnosis and feedback options.

## References

[1] http://github.com/vakila/de-stress

[2] A. S. Vakil and J. Trouvain, "Automatic classification of lexical stress errors for German CAPT," in *SLaTE*, 2015.

[3] http://jsnoori.loria.fr