CORPUS AIMS AND CONTEXT
- Corpus: a bilingual speech corpus recorded by French learners of German and German learners of French in their native and second languages
  - four sub-corpora: French/German, German/French, French/French and German/German
  - size: 100 speakers (50 French, 50 German), and 120 sentences (60 F, 60 G)
  - 6,000 non-native and 6,000 native sentence realizations
- Beginners and advanced speakers
- Existing learner corpora: mainly for written language and mainly for English as target language; only a few parallel corpora for language pairs
- Aims:
  - data and analysis for phonetic and phonological research
  - training and test material for automated feedback system
  - make the corpus available to scientific community (audio files annotated at segmental and prosodic levels)
- Project: Individualised feedback in computer-assisted spoken language learning (IFCASL), supported by ANR and DFG (Deutsche Forschungsgemeinschaft)

SELECTED SPEECH PHENOMENA
Speech phenomena of interest for the French/German pair (non exhaustive list), covering segmental and prosodic levels as well as spelling problems

- Example: French sentence “Le bateau est arrivé au port” (the boat arrived at the port) See Figure1

![Image](le_bateau_est_arrivé_a_port.png)

Figure 1. French sentence uttered by an advanced German speaker (top) and a beginner (bottom). The red arrows indicate the presence of aspiration on [p] for the beginner and its absence for the advanced speaker. The green arrow indicates the mandatory liaison ([e] + [t] + [e]) and the symbol # indicates pauses only realized by the beginner here.

- Speech sounds either not present in French or German, of differently realized, special phonological processes, different mapping between acoustic cues and prosodic units:
  - German glottal fricative and glottal stop ([h], [ʔ]), ich & ach sound ([ç], [x])
  - French nasal vowels ([ɛ], [ɔ], [ɔ̃]) as consonant ([s], [x]) vs. vowel [e]
  - Schwa: level of rounding and confusion with full vowel
  - Final devoicing of plosives and fricatives in German
  - Aspiration of unvoiced plosives ([p], [t], [k]) in German
  - Vowel length (long vs. short vowels in German)
  - Liaisons in French
  - Rythm, contrastive accent and lexical stress accents

- Spelling and cognates:
  - Spelling-to-sound relationships: French “loup” (loʊ)] as [lʊp]
  - Cognates: French “énergie” read as German (ener‘gj] in L2=FR
  - Internationalisms: German “Berlin” read as French [berl] in L2=DE

LINGUISTIC MATERIAL
- Four speaking conditions:
  - (1) Sentence reading
  - (2) Sentence repetition: to exclude spelling-induced errors
  - (3) Focus sentences: to elicit variable locations of sentence accents
  - (4) Text reading: read aloud a small written text (“the three little pigs”)
- Sentences (conditions 1-2) designed to contain:
  - all target speech phenomena
  - liaisons and sentence traps only in sentence reading condition
  - all speech sounds of a given language
  - quasi-minimal pairs in order to observe speech contrasts (e.g. opposition between short and long vowels) in similar contexts
  - set of sentences covering a given phenomenon for a series of sounds (e.g. voicing for stops) in variable contexts

RECORDING AND LABELLING
- Recordings: High-quality recordings, using the software JCorpusRecorder (see rusch.inria.fr). Headset microphone (AKG C520) and Audiobox (M Audio Fast track).
- Six labelling tiers and a comment tier (Praat software) see Figure 2:
  - Phone level in machine-readable phonetic notation (SAMPA):
    - realised form as detected by (LORIA) automatic alignment: AlignTier
    - realised form (manual correction of AlignTier): RealTier
    - canonical form (what is expected): CanonTier
  - word, sentence (TextTier), prosodic Tier (absent in Fig.2) and comments
- Annotations:
  - insertions, deletions, substitutions,
  - special phonetic phenomena (fine phonetic transcription): assimilation of voicing, glottalisation...

![Image](automatic_alignment.png)

Figure 2. Automatic alignment and corrections of a German sentence produced by a French speaker learning German (FG) “Wir essen Gemüse aus unserem Beut.” “We eat vegetables from our patch.”

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<th>Focus Texte</th>
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<tr>
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Subjects
- Beg. T: Number of sentences for each language (left) and number of subjects (left). Rep. for repeated, Beg. for beginners, Adv. for advanced, T. for teenagers

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Corpus size: number of sentences for each language (left) and number of subjects (left). Rep. for repeated, Beg. for beginners, Adv. for advanced and T. for teenagers

METHODOLOGY:
- a two step process to constitute the corpus, choose phenomena of interest and their distribution in sentence conditions
  - (1) a bilingual corpus with few speakers (14) including all sounds of each language and all speech phenomena of potential interest was recorded and analysed
    - Its analysis revealed/confirmed:
      - the existence of special strategies due to sentence reading and sentence listening conditions
      - the importance of recording duration (the whole corpus should not last more than one hour to avoid subjects’ fatigue)
      - the frequency and importance of some mispronunciations (voicing problems, erroneous presence (or absence) of /h/ for German (or French) non-native speakers, rhythm ...)
  - (2) Constitution of the final corpus, presented here, which puts a focus to the problems revealed by the preliminary corpus