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Karlsruhe Institute of Technology

CSL
Cognitive Systems Lab

Automatic Detection of Anglicisms for the Pronunciation Dictionary Generation: A Case Study on our German IT Corpus

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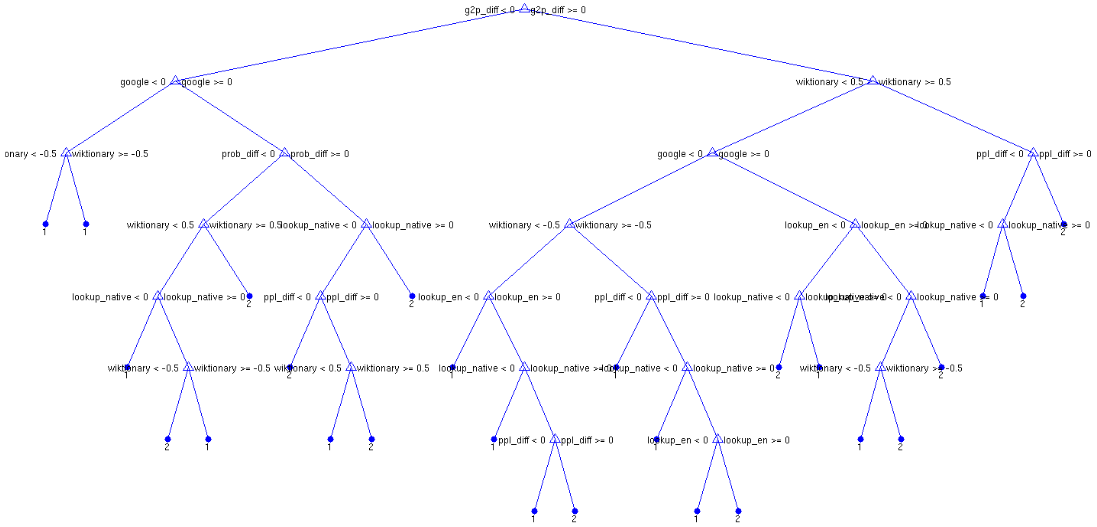
*Zeigen
Sie
andere
Apps
für
einfaches
Multitasking
neben
dem
Browser
an
Internet
Explorer
nutzt
Hardwarebeschleunigung
Websites
werden
schneller
geladen
damit
Sie
noch
reibungsloser
surfen
können*

*Nimm
deine
Lieblingsmusik
überallhin
mit
kommt
der
iPod
shuffle
mit
Speicher
genug
für
hunderte
von
Songs
alle
wichtigen
Songs
fürs
Training
Wiedergabelisten
Genius
Mixes
Podcasts
und
Hörbücher*



Motivation

- From Microsoft's German website www.microsoft.de:
  - *“Zeigen Sie andere **Apps** für einfaches **Multitasking** neben dem **Browser** an.”*
  - *“**Internet Explorer** nutzt **Hardware**beschleunigung. **Websites** werden schneller geladen, damit Sie noch reibungsloser **surfen** können.”*

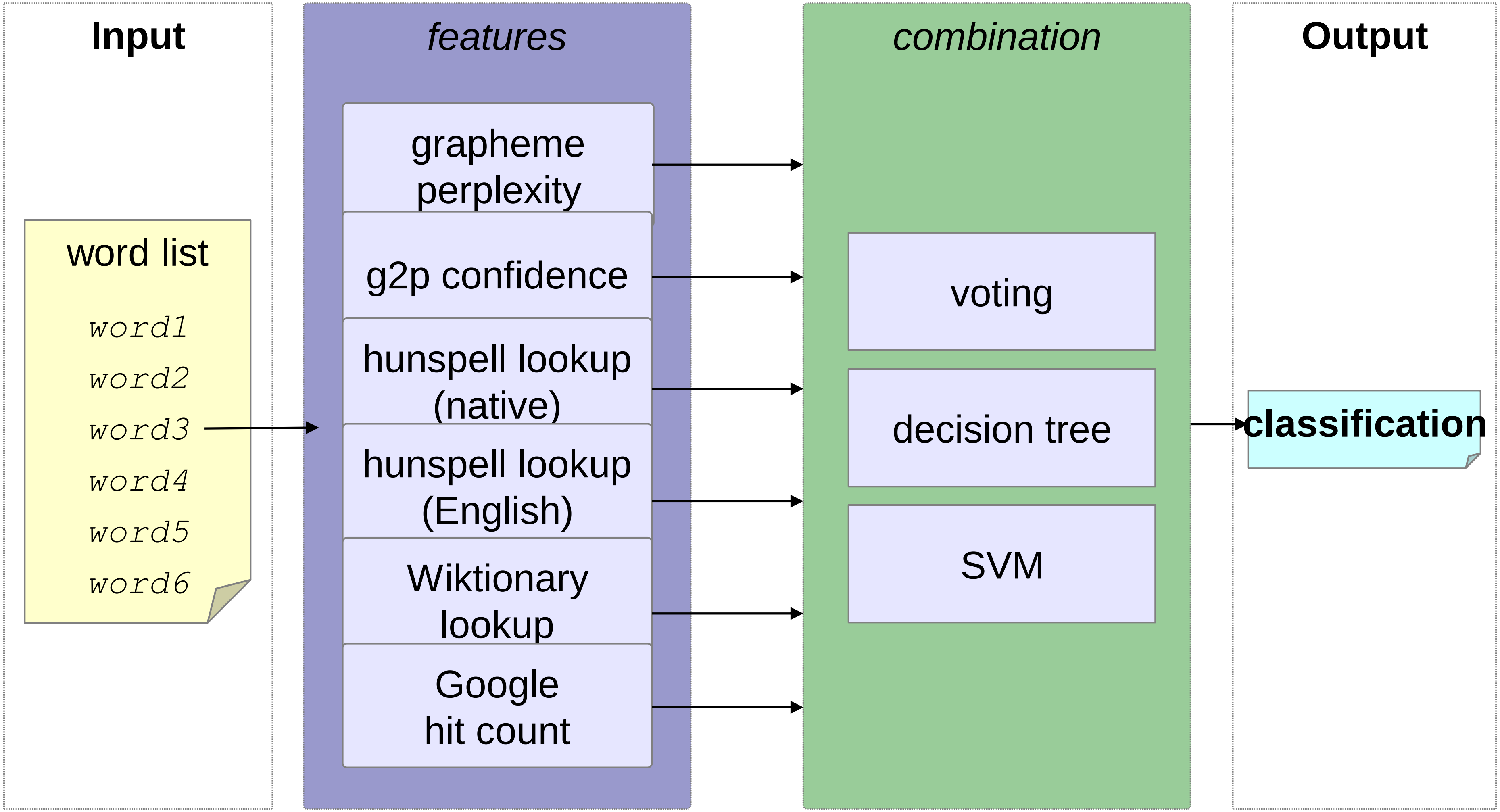
Motivation

- With the globalization words from other languages come into a language without assimilation to the phonetic system of the new language

- To economically build up lexical resources with automatic or semi-automatic methods

  → detect and treat them separately

Overview


Input
word list
word1
word2
word3
word4
word5
word6
features
grapheme perplexity
g2p confidence
hunspell lookup (native)
hunspell lookup (English)
Wiktionary lookup
Google hit count
combination
voting
decision tree
SVM
Output
classification

Outline

1. Motivation and Overview
2. Test Sets
3. Single Features
4. Combinations
5. Summary and Future Work

Test Sets - Domains

- **German IT website**
  - www.microsoft.de
  - 4.6k unique words
- **German general news**
  - www.spiegel.de
  - 6.6k unique words
- **Afrikaans**
  - NCHLT corpus (*Heerden, Davel, Barnard, 2013*), (*Basson, Davel, 2013*)
  - 9.4k unique words

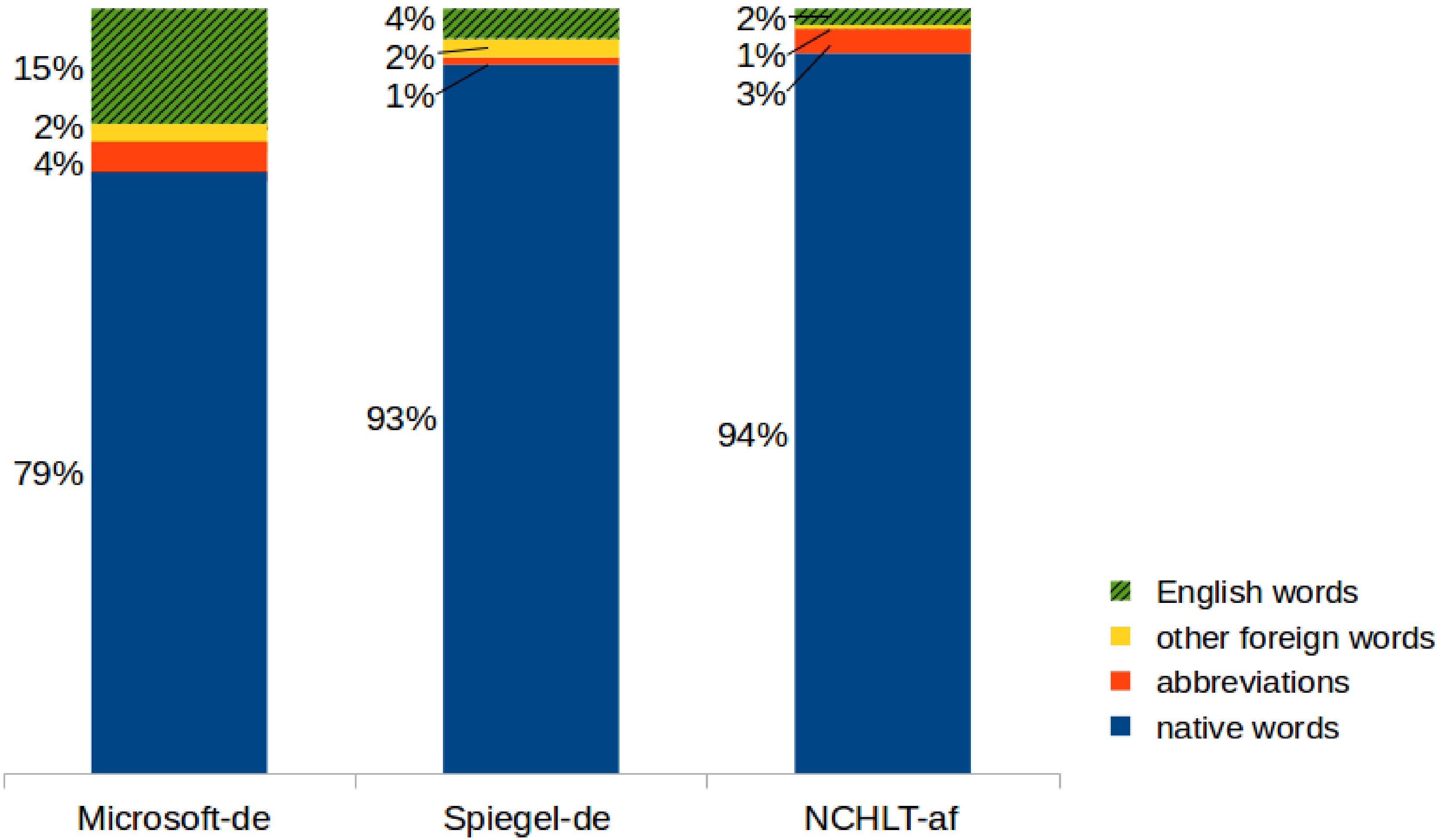
Test Sets - Domains

- Tag for
  - “**English**”:
    - e.g. Software, Brain, …
  - **Foreign hybrids**
    - Compound words
      - e.g. Schadsoftware, …
    - Grammatically adapted words
      - e.g. downloaden, …

- Different word categories:
  - **Abbreviations**:
    - e.g. UV, CIA, …
  - **Other foreign words**
    - Compound words
      - e.g. Français, Niveau, …

- Decisions based on
  - Agreement of annotators
  - duden.de

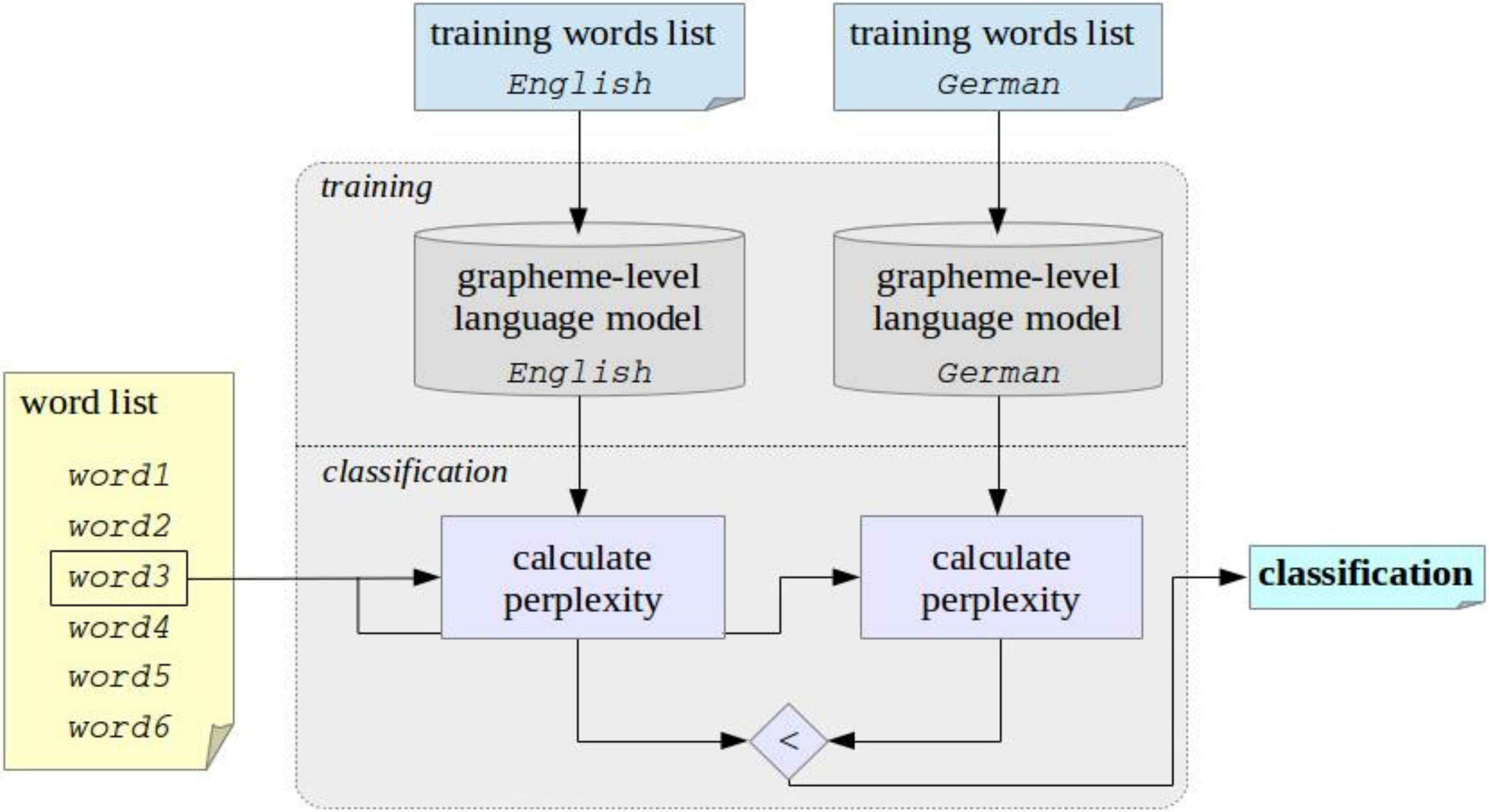
Foreign words in different test sets



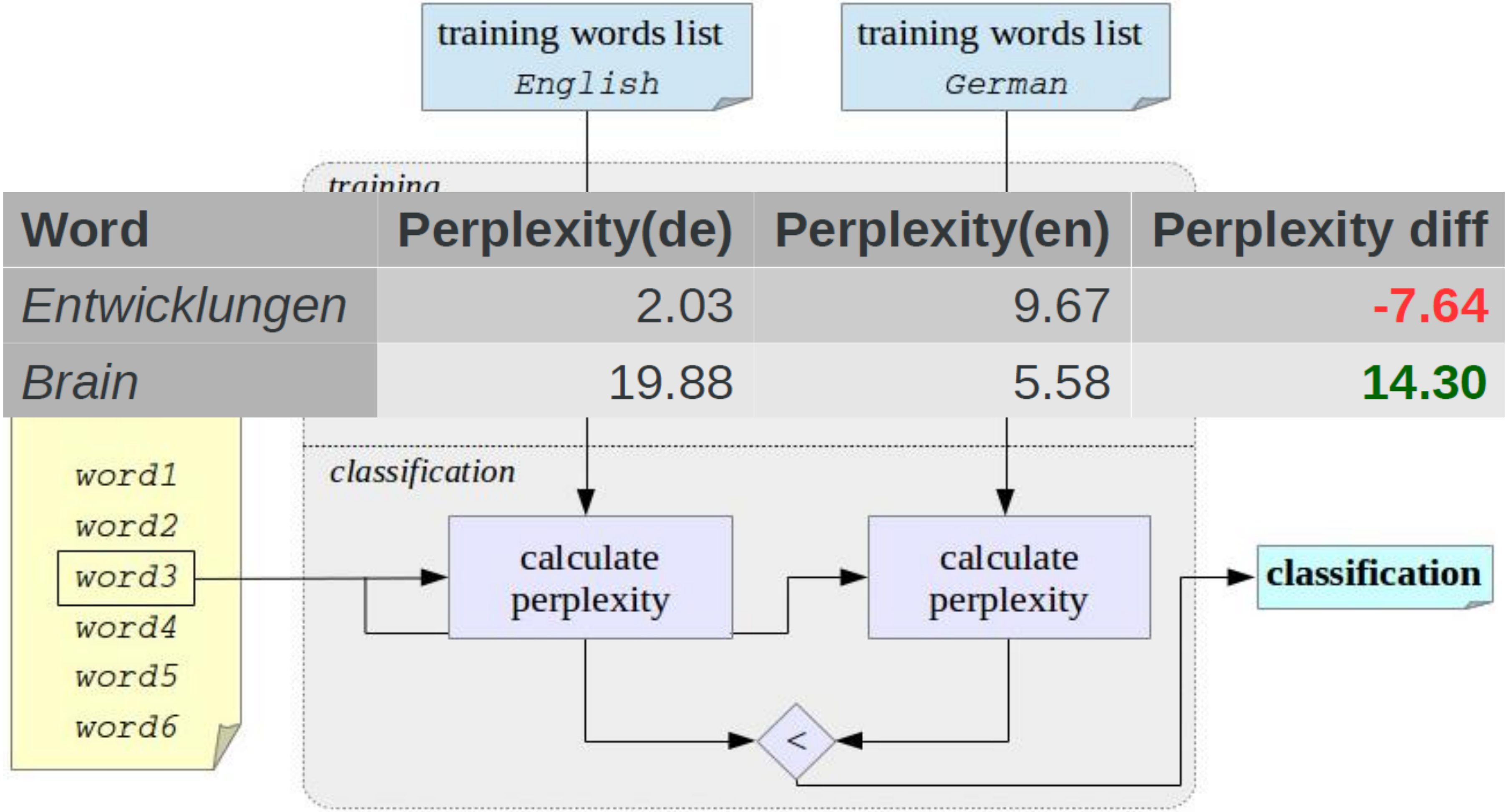
Single Features – Design Criteria

- Features trained on commonly available resources
  - Word lists, Pronunciation dictionaries, Spellchecker dictionaries, Wiktionary, Google
- Thresholds without supervised training
  - Comparison between English and native models
- New approaches

Grapheme Perplexity

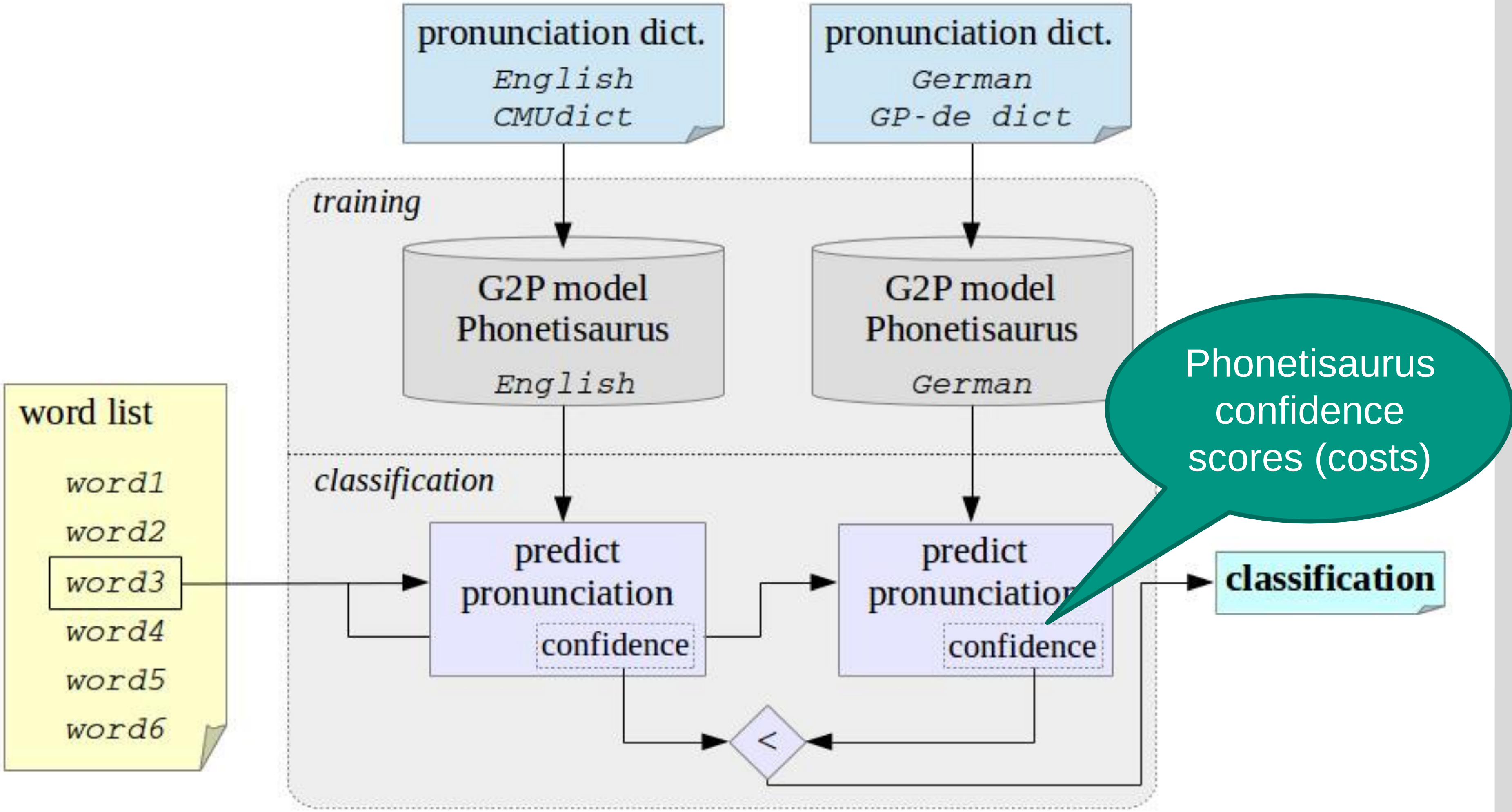


Grapheme Perplexity



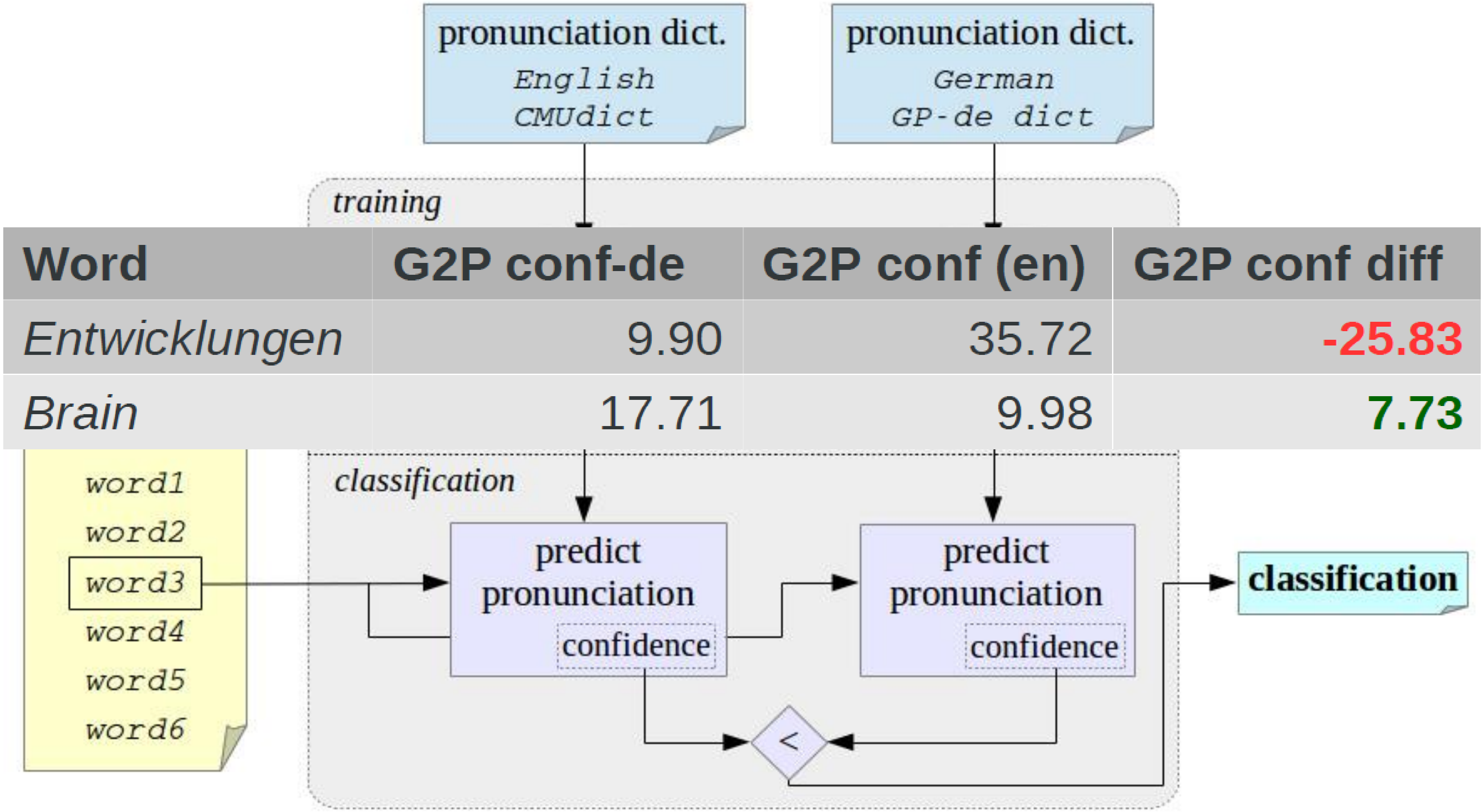
Word	Perplexity(de)	Perplexity(en)	Perplexity diff
Entwicklungen	2.03	9.67	-7.64
Brain	19.88	5.58	14.30

Grapheme-to-Phoneme Confidence



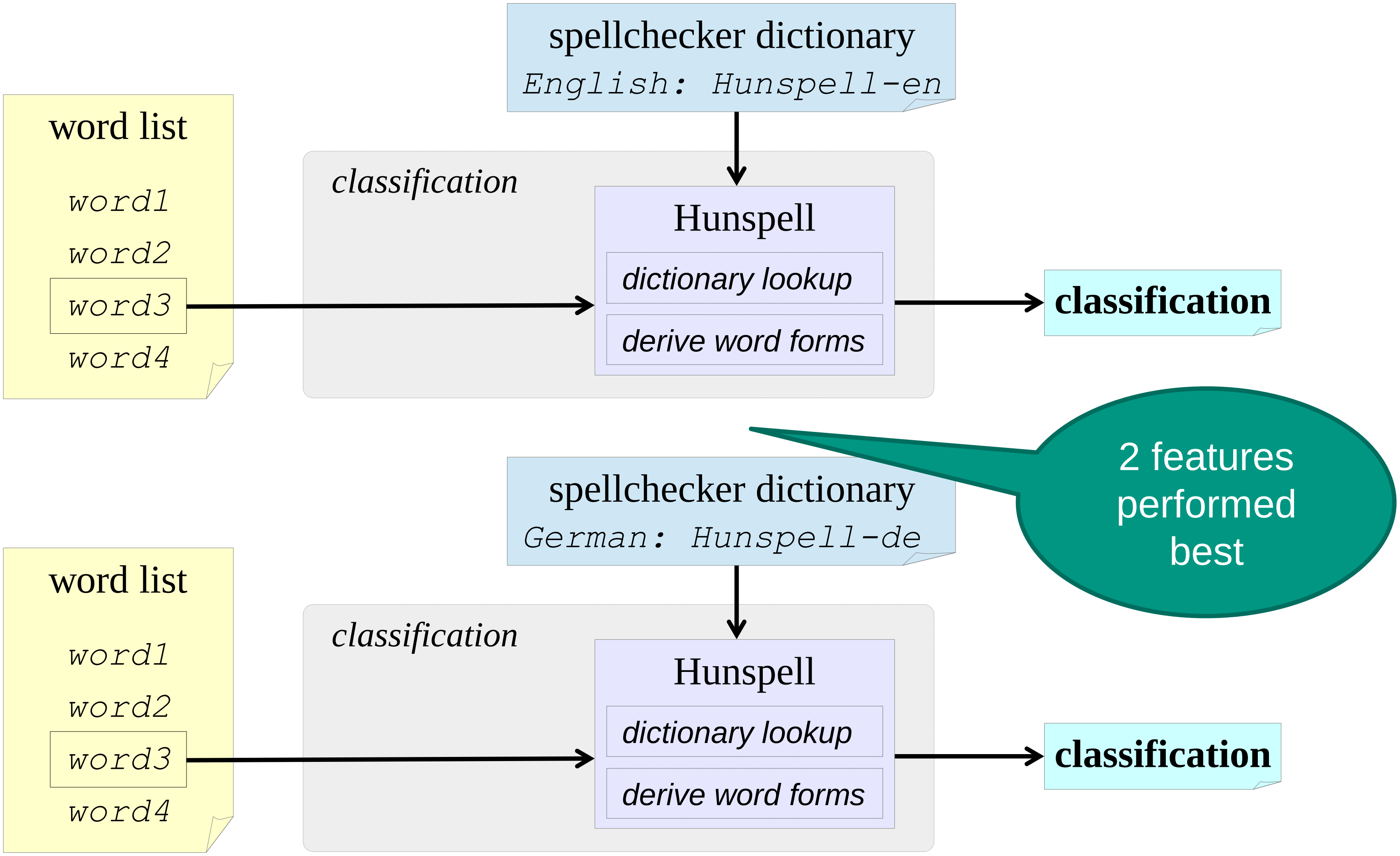
Phonetisaurus confidence scores (costs)

Grapheme-to-Phoneme Confidence



Word	G2P conf-de	G2P conf (en)	G2P conf diff
Entwicklungen	9.90	35.72	-25.83
Brain	17.71	9.98	7.73

Hunspell Lookup



spellchecker dictionary
English: Hunspell-en

word list
word1
word2
word3
word4

classification

Hunspell
dictionary lookup
derive word forms

classification

spellchecker dictionary
German: Hunspell-de

word list
word1
word2
word3
word4

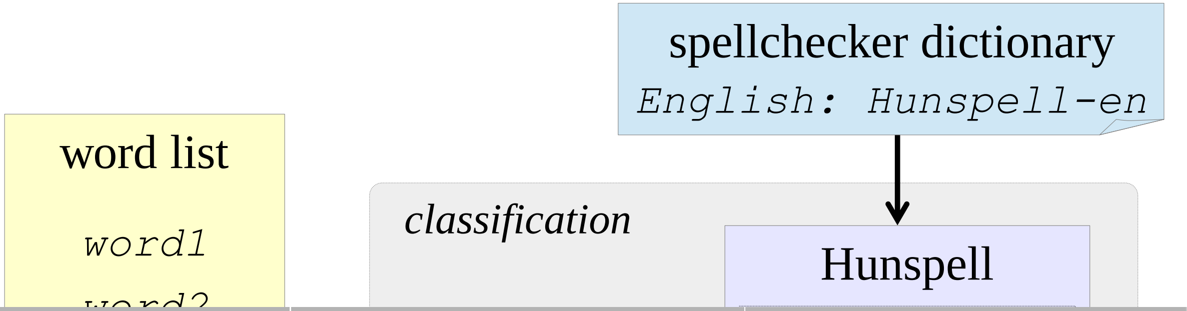
classification

Hunspell
dictionary lookup
derive word forms

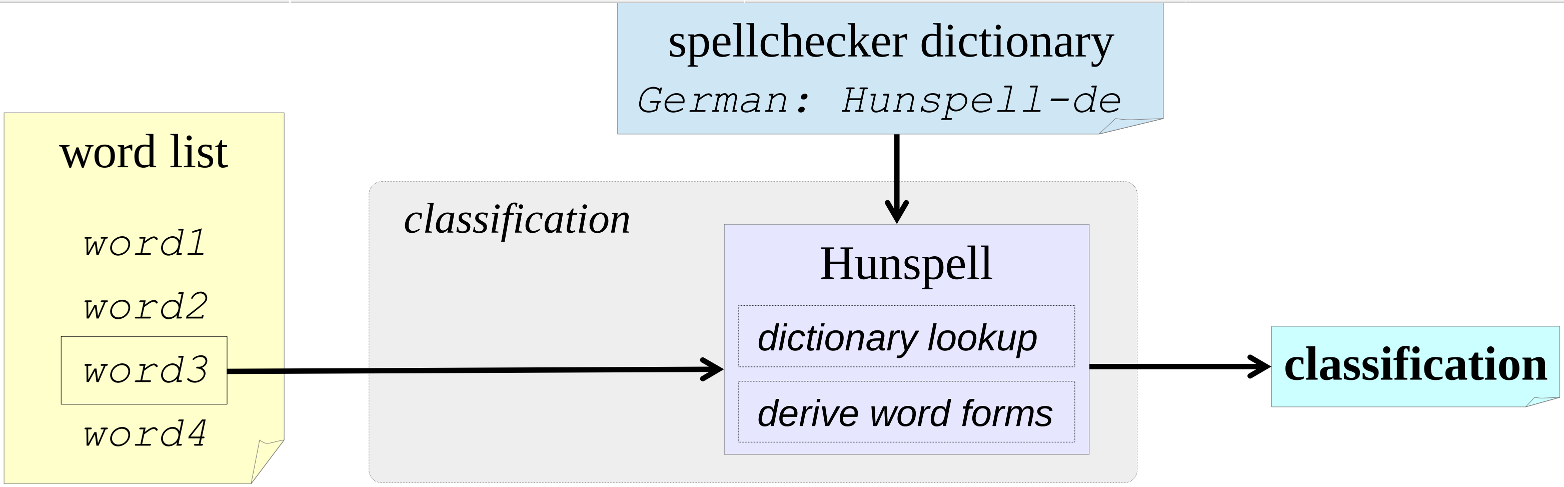
classification

2 features performed best

Hunspell Lookup

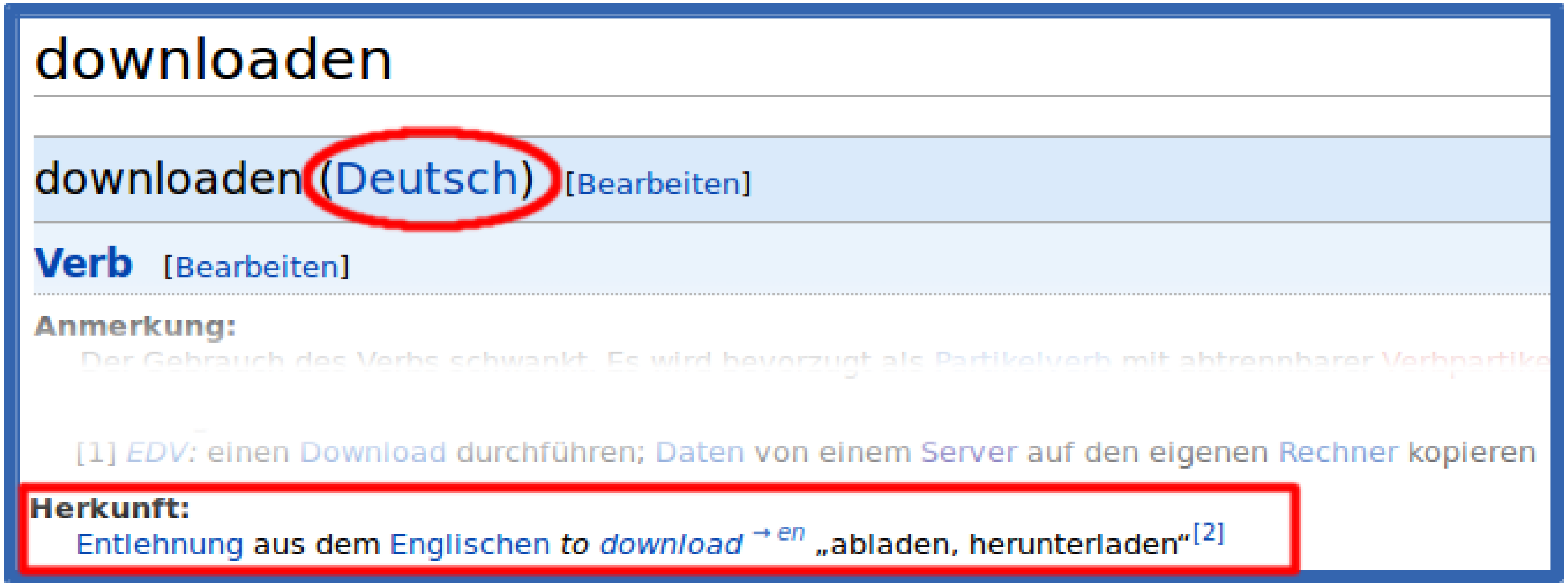


Word	Stem	Dictionary(de)	Dictionary(en)
Entwicklungen	→ Entwicklungs	yes	no
Brain	-	no	yes



Wiktionary Lookup

- Check crowdsourced information from matrix language Wiktionary



downloaden

downloaden (Deutsch) [Bearbeiten]

Verb [Bearbeiten]

Anmerkung:

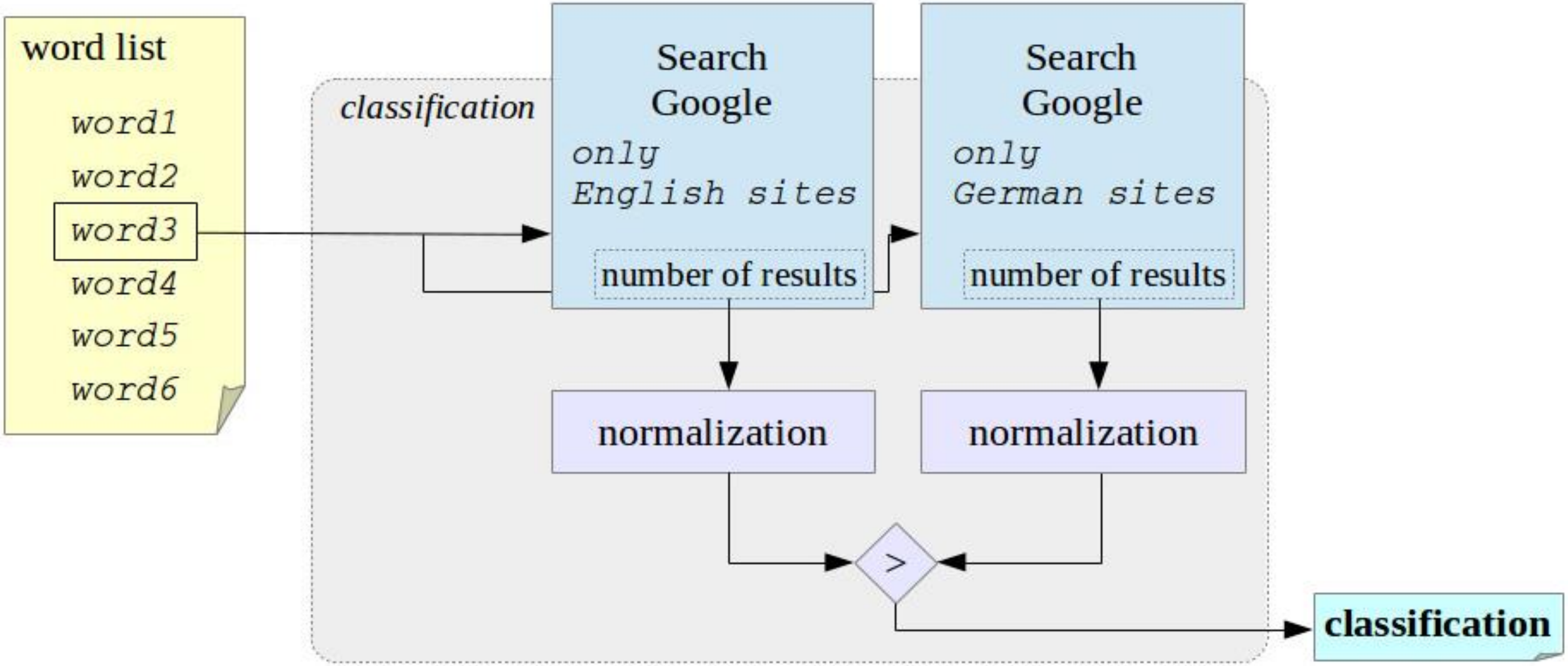
Der Gebrauch des Verbs schwankt. Es wird bevorzugt als Partikelverb mit abtrennbarer Verbpartike

[1] *EDV:* einen Download durchführen; Daten von einem Server auf den eigenen Rechner kopieren

Herkunft:

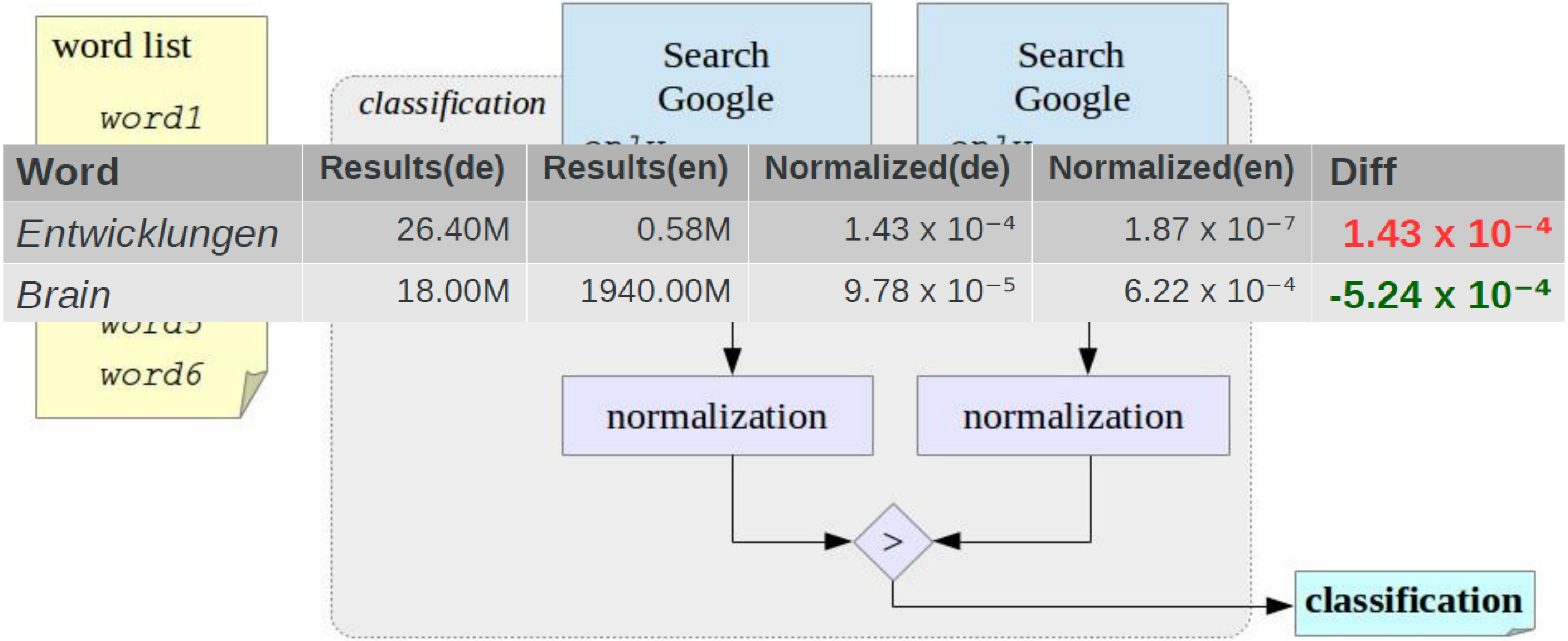
Entlehnung aus dem Englischen *to download* → en „abladen, herunterladen“[2]

Google Hit Count



- Based on Alex B. (2008) “Automatic Detection of English Inclusion in Mixed-lingual Data with an Application to Parsing”, University of Edinburgh

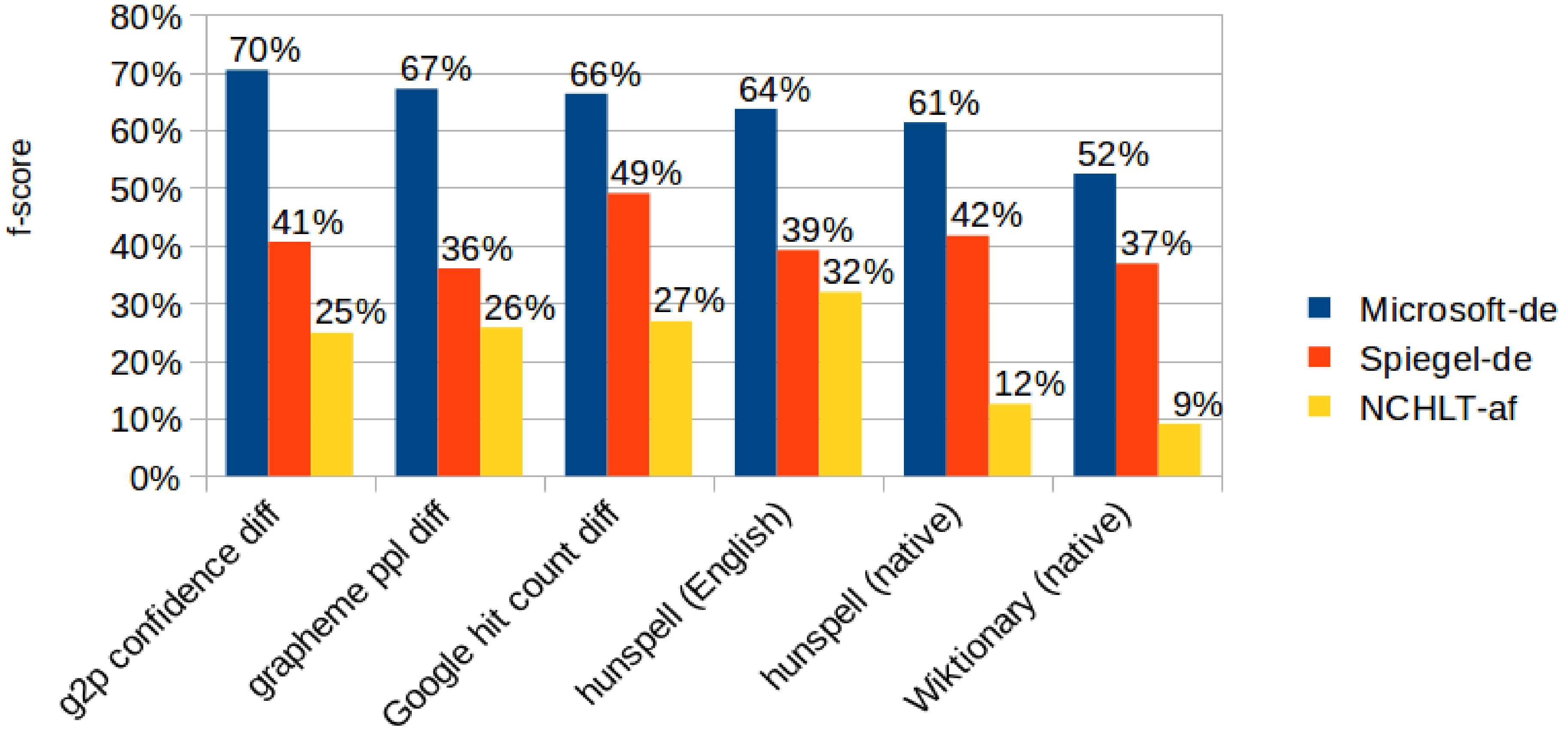
Google Hit Count



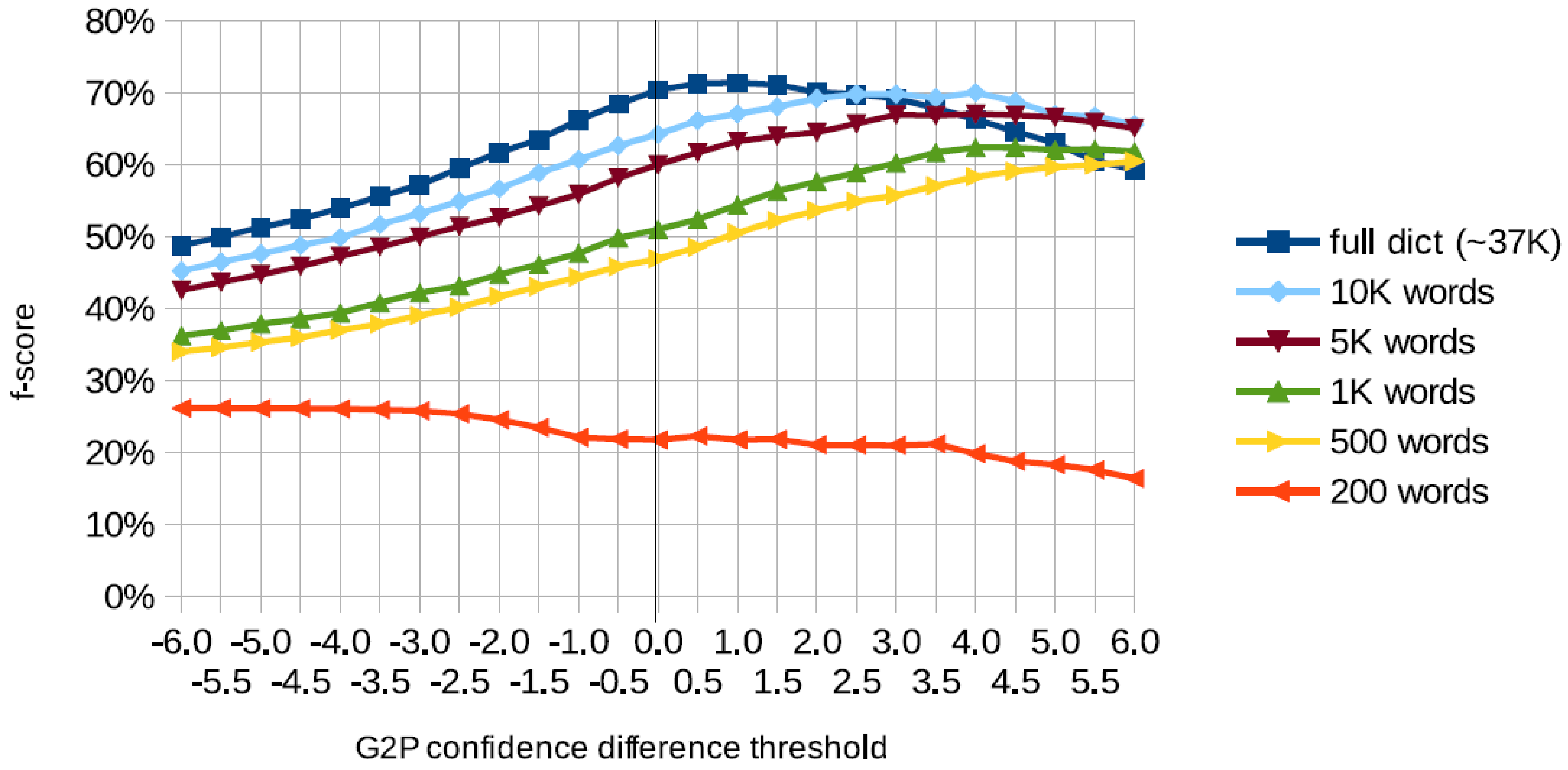
Word	Results(de)	Results(en)	Normalized(de)	Normalized(en)	Diff
Entwicklungen	26.40M	0.58M	1.43 x 10^{-4}	1.87 x 10^{-7}	**1.43 x 10^{-4}**
Brain	18.00M	1940.00M	9.78 x 10^{-5}	6.22 x 10^{-4}	**-5.24 x 10^{-4}**

- Based on Alex B. (2008) “Automatic Detection of English Inclusion in Mixed-lingual Data with an Application to Parsing”, University of Edinburgh

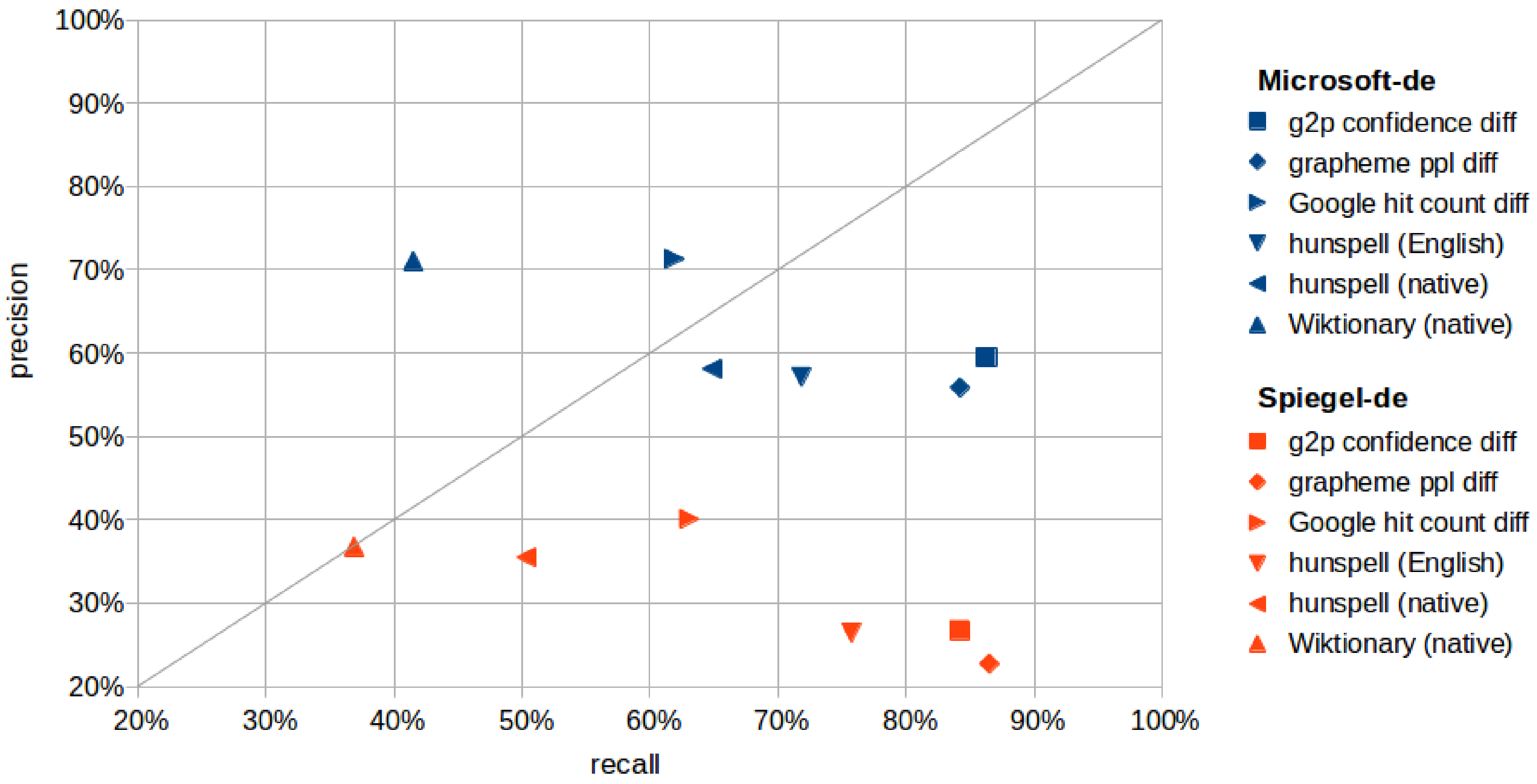
Result: Single Features



Grapheme-to-Phoneme Confidence

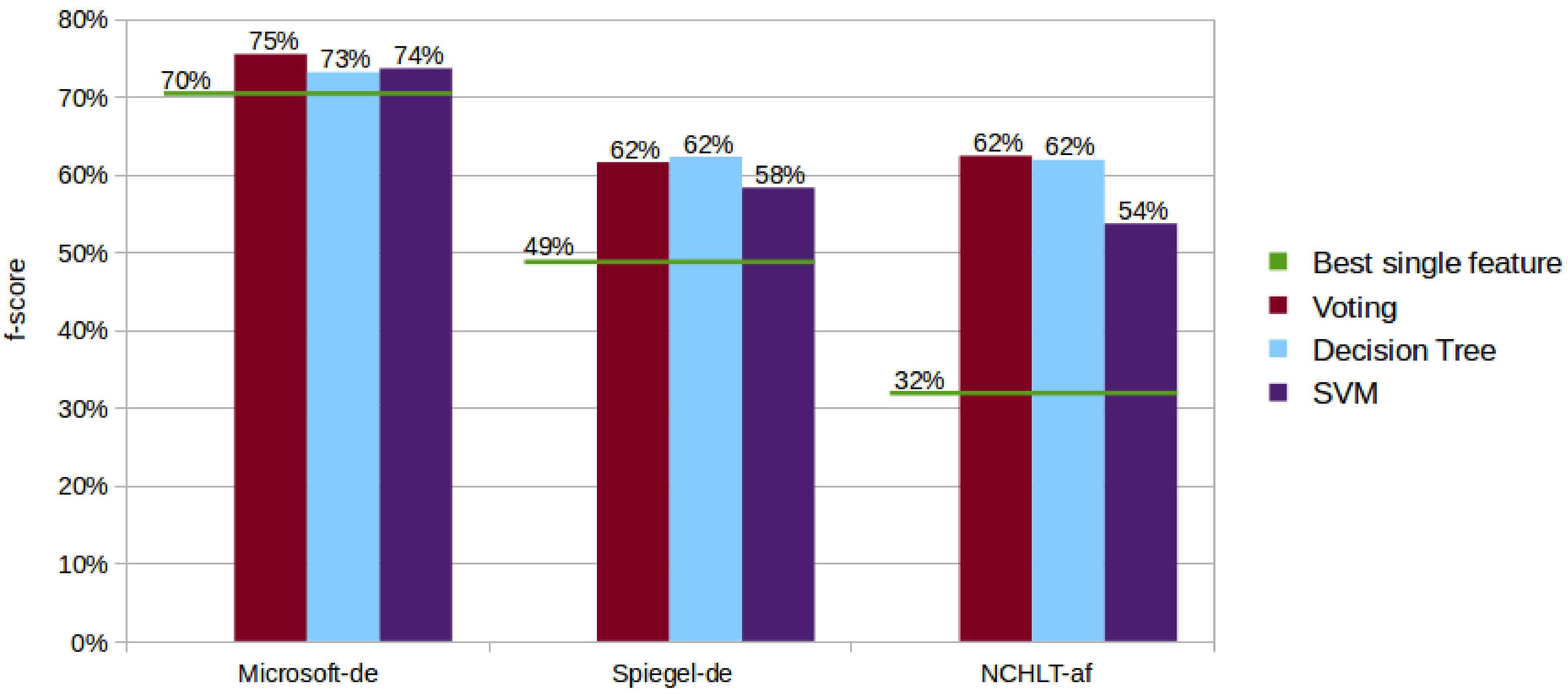


Result: Single Features



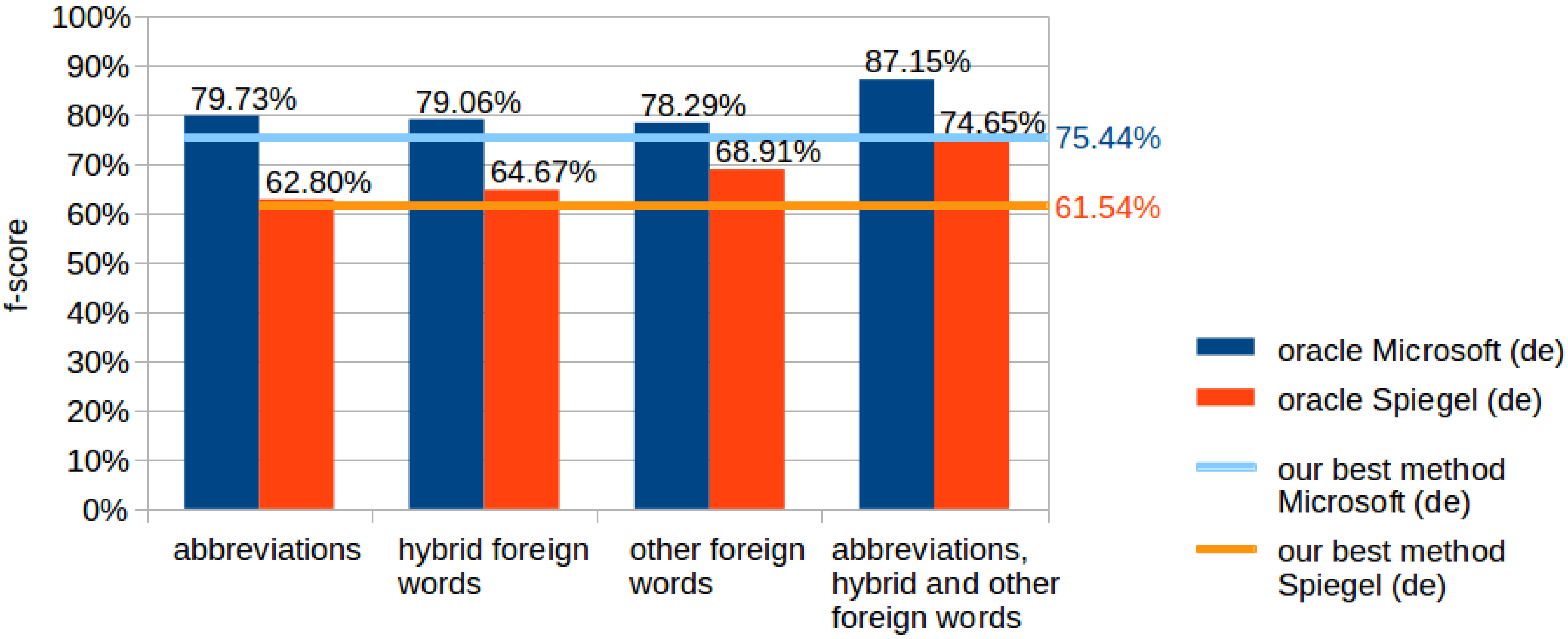
➔ On Spiegel-de test set: Higher ratio of words classified as English are wrong

Result: Combination



Challenges

- Performance after filtering difficult words (oracle)

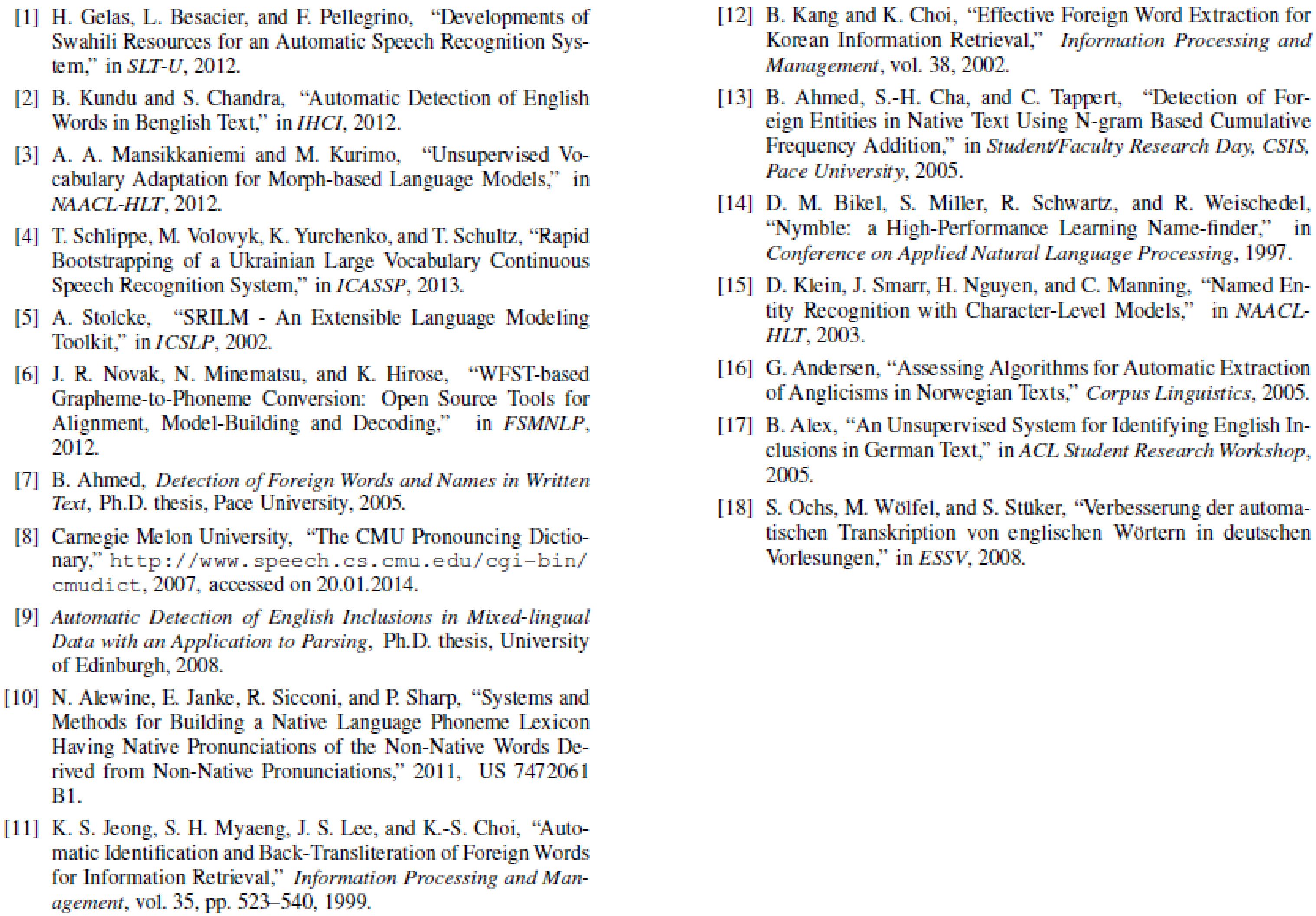


Conclusion and Future Work

- Features based on available sources
- New approaches:
  - G2P confidence
  - Wiktionary
- Further features:
  - Part-of-speech (POS)
  - Context, trigger words
  - Capitalization
  - Translate and compare

благодари́м за внима́ние!

References



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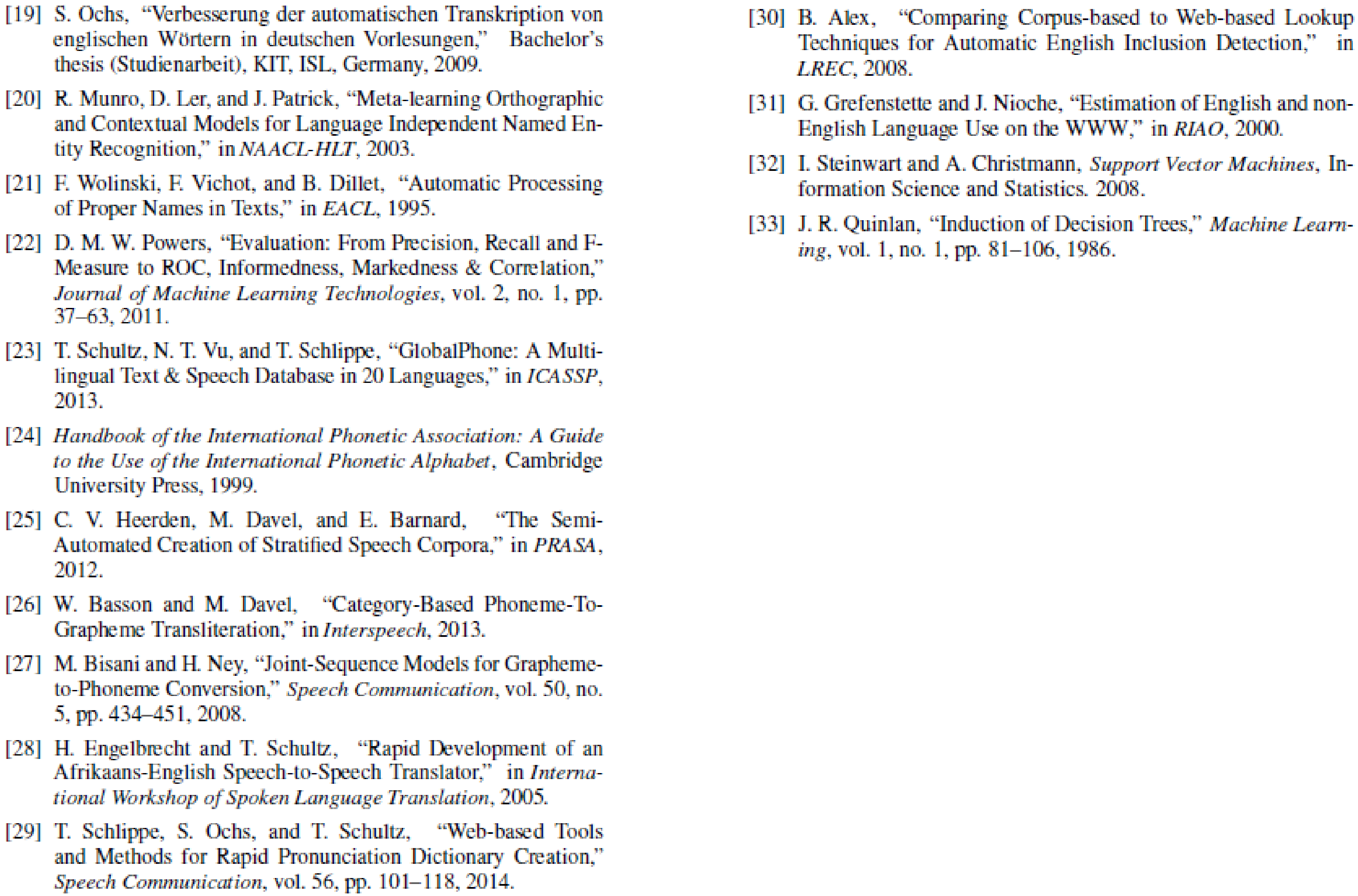

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