21. Phonetik und Phonologie im deutschsprachigen Raum

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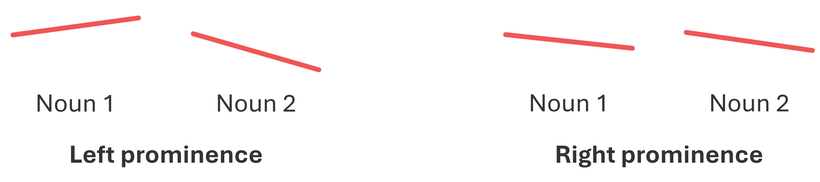
PHONETIK UND PHONOLOGIE IM DEUTSCHSPRACHIGEN RAUM

English compound semantics are predictable by compound prominence and vice versa

Motivation

Received wisdom

- Compound stress
  - Left-stressed compounds: *cam**paign** promise* *__child__ care* *pro**ba**tion officer*
  - Right-stressed compounds: *Boston __har__bour* *home __phone__* *silk __tie__*
- About ⅓ of compounds are right-stressed [1-3]
- Many compounds are variable [4]
- Many factors influence stress perception [1-12]
  - semantic relation, specificity, and class, family size, analogy, lexicalization, length, speaker, …



Today's focus

- From categorical stress to pitch contours
- From categorical semantics to contextualized semantics, cf. [13] for Mandarin

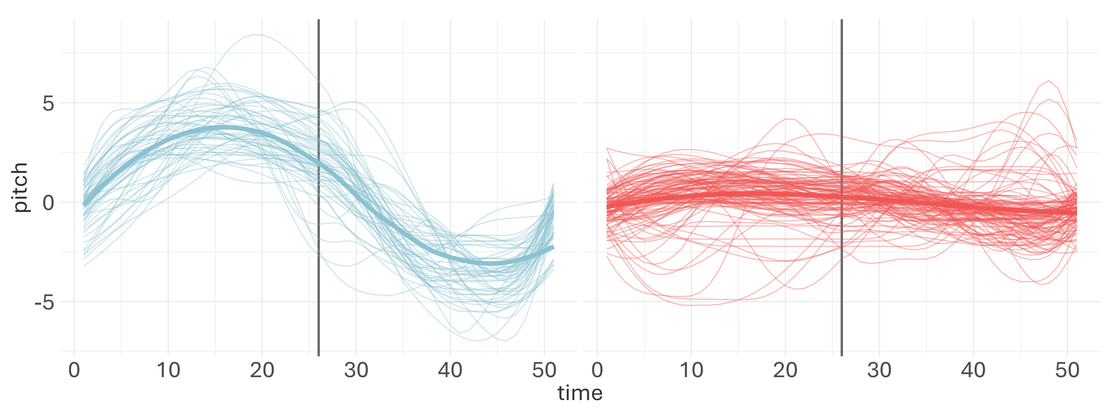
Data

- Boston University Radio Speech Corpus [14]
- American English, news texts, professional radio news presenters as speakers
- Noun-noun compounds: N = 4327, V = 2476
- Pitch data was extracted using sound files and TextGrids with the rPraat package [15]
- Processing steps: removal of octave jumps and erroneous pitch in voiceless segments, smoothing via the PraatSmooth algorithm of the soundgen package [16], transformation from Hz to semitones, centering by token, sampling at 51 equally spaced points in time

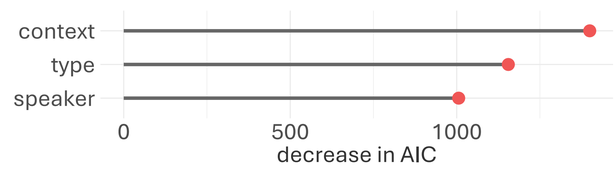
Sample

The device is attached to a plastic **wristband**. It looks like a watch. It functions like an electronic **probation officer**. When a computerized call is made to a former prisoner's **home phone**, that person answers by plugging in the device. The **wristband** can be removed only by breaking its clasp, and if that's done the inmate is immediately returned to jail. The description conjures up images of big brother watching. But Jay Ash, **deputy superintendent** of the Hampton County jail in Springfield, says the **surveillance system** is not that sinister.

Contours



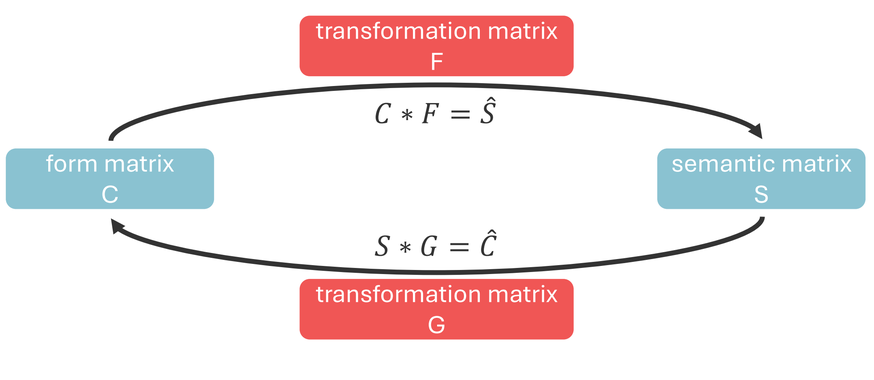
- Based on subset with N = 10, V = 167 to control for
  - context: each type occurs at least in 2 contexts, 27 contexts overall
  - speaker: each context is produced by at least 2 speakers
- Optimal clustering with k-means for longitudinal data: k = 2
- GAMs to model pitch as a function of time in interaction with predictors



Semantics

- Linear discriminative learning [17] to investigate whether pitch contours contain semantics
- Based on subset with N = 397, V = 79 to control for
  - context: each type occurs in at least 3 contexts
  - speaker: each context is produced by 1 speaker, at least 2 speakers per type
- How it works
  - Building associations between representations ('cues' and 'outcomes')
  - Association weight increases every time a given cue and a given outcome co-occur; decreases whenever the cue occurs without that outcome
  - Here: form = pitch data, meaning = context-dependent semantic vectors [18]
  - Train the network in leave-1-out style, predict the left-out token:

    Is the nearest neighbour of that token a token of the same type?



chance accuracy	**comprehension** form to semantics	**production** semantics to form
2 %	11.6 %	19.1 %

Discussion

- Pitch contours are predictable from contextually-informed semantics
- Semantics is predictable from pitch
- Predicting the pitch contours is easier than predicting the semantics
- Estimating 768 dimensions from 51 is more difficult and error-prone than the reverse
- Relationship between pitch and compound prominence is more complex than previous analyses suggest
- Speaker, compound, and context contribute to pitch contours
- Possibility of direct mapping from speech signal to experience-based semantics and vice-versa suggests language could involve a direct mapping between signal and semantics, with abstract categories being emergent

References

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