Detecting Errors in Corpus Annotation

Variation Detection in Spoken Language Treebanks
(Dickinson & Meurers 2005a)

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The challenges of spoken language

- Transcribed spoken language corpora differ from written language corpora in a variety of ways, including:
  - Repetitions, false starts, and other speech errors
  - Typically shorter sentences
  - Punctuation inserted into a transcription
- Not much systematic work on syntactic annotation error analysis for spoken language corpora.

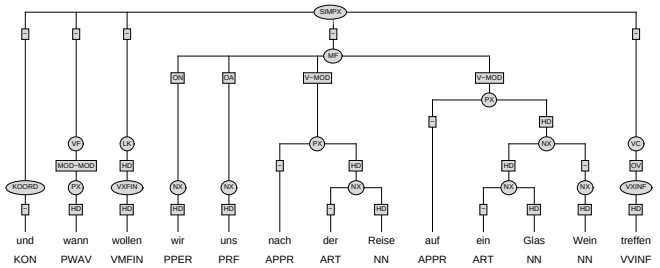
Error detection for spoken language corpora

- What is involved in applying the variation *n*-gram error detection method to a spoken language corpus?
- What insights can be gained for the annotation scheme and the method?
- For our case study, we used
  - 24,901 dialog turns (248,922 tokens) of the German Verbmobil treebank (Hinrichs et al. 2000),
  - focusing on the syntactic annotation.

The Verbmobil corpus

- Domain-specific: transcripts of appointment negotiation, travel planning, hotel reservation, and personal computer maintenance scenarios
- Annotation consists of tree structures with node and edge labels (Stegmann et al. 2000)
  - tree structure encodes:
    - topological field structure at top-level
    - syntactic categories
  - node labels encode:
    - sentence level: turn type
    - field level: topological field names
    - phrase level: syntactic categories
    - lexical level: STTS POS (Schiller, Teufel & Thielen 1995)
  - edge labels on phrase level encode:
    - grammatical functions

A simple example from the Verbmobil corpus



Two interesting aspects of the corpus

- **Repetition**: dialogues on a specific topic tend to include the same contents
  - → One encounters the same strings again and again in a corpus.
  - For example, one finds 35 instances of

    (1) , *guten Tag* , *Frau*
    , good day , Mrs.

    33 times as DM/NX and twice as NIL.
- **Hesitations and false starts**: identical words appear next to each other.

  (2) *und und Auto*
  and and car

  → Surrounding context is not informative in such cases.

Applying the variation *n*-gram approach

- We used the variation n-gram algorithm developed for discontinuous syntactic annotation (Dickinson & Meurers 2005b).
- Dialog turn boundaries are used as borders for *n*-gram expansion.
- 1426 nonfringe variation nuclei are detected
  - largest size: 14 words
- compare to 500 nuclei detected for TIGER treebank, a corpus of written text three times as large.

The nature of dialog turns

- Investigated the effect of stopping the *n*-gram search at dialog turn boundaries
  - Allowed *n*-grams to go beyond a dialog turn
  - Obtained 1720 shortest variation nuclei
  - Gain of 20% over the case where variation detection is limited to a single sentence

⇒ Repeated segments frequently go beyond one dialog turn.

The nature of punctuation

- Investigated the role of punctuation, inserted into transcribed speech of the corpus
  - Removed all punctuation from the corpus and reran the error detection code (ignoring dialog turn boundaries)
  - Obtained 1056 shortest variation nuclei
  - Loss of almost 40% of detected cases

⇒ Punctuation inserted in speech corpora provides useful context for detecting variation *n*-grams.

Punctuation ambiguity

- Punctuation symbols are not always reliable indicators of context identity.
- Commas after enumerated list element (NX underlined):

  (3) *das wäre Donnerstag , Freitag , Samstag .*
  that would be Thursday , Friday , Saturday .

- Commas used in date expressions (NX underlined):

  (4) *ab achten Mai , Freitag , den achten Mai , hätte*
  from eighth May , Friday , the eighth May , would've
  ich für vier Tage Zeit
  I for four days time

⇒ Attractive to distinguish different uses of punctuation.

Problems disambiguating locally

- In specific cases, local context is not sufficient.
- Example: *fahren* (drive) in variation 4-gram (5)

  (5) a. *wir wollten nach Hannover fahren .* (VXINF)
  we wanted to Hannover drive .

  b. *daß wir am Mittwoch und Donnerstag*
  that we on Wednesday and Thursday
  nach Hannover fahren . (VXFIN)
  to Hannover drive .

⇒ A more sophisticated notion of context for such cases?

Distinguishing levels of annotation

- The Verbmobil annotation employs different kinds of non-terminal categories:
  - sentence level: turn type
  - field level: topological field names
- Danger of comparing "apples with oranges"
- Problem surfaces frequently for unary projections, e.g,
  - NX noun phrase (e.g., as part of the Mittelfeld)
  - NF/NX for extraposed noun phrase (NF = Nachfeld)

⇒ Identify these as different representation levels, which need to be kept distinct for variation analysis

- Topological field labels also inherently non-endocentric:
  - "The C-position only occurs in verb-final clauses", but whether a clause is verb-final or not is a property of the sentence, not of the C field itself.

Summary

- The variation *n*-gram approach can be applied to spoken language corpora to detect annotation errors.
- Repetitions are prevalent in domain-specific speech, which makes method well-suited for detecting errors in such corpora.
- The role of segmentation, inserted punctuation, and the nature of repetition requires special attention.

References

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