Anaphora Resolution - What Helps in German

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Introduction

Features used in anaphora resolution systems:

- Distance (position)
- Syntax (binding constraints, grammatical functions)
- Same types of features employed across languages
- But: Anaphora resolution is not language independent!
 - Features that are especially helpful in German
 - Differences to other languages

The Data

Tübingen Treebank of Written Text (TüBa-D/Z), release 1

- 15 260 sentences from the daily newspaper "die tageszeitung"
- 4 levels of syntactic constituency (lexical, phrasal, clausal, topological fields)
- POS layer augmented with inflectional morphology
- Annotation of constituents with grammatical functions
- Annotation of referential relations

Advantages of rule-based AR systems Resolution of Anaphora Procedure Two-Step Resolution Process Feature Set and Salience Hierarchy

Rule-based Systems for Anaphora Resolution

Advantages of rule-based systems for this purpose:

- · Selection of antecedents controlled by rules
- Rules rely on manually weighted features
- Linguistically motivated changes to rules and features are possible
- Effects of changes are directly observable
- Influence of features and rules on the anaphora resolution process can be examined

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Resolution of Anaphora Procedure (RAP)

- Original version for English by Lappin and Leass (1994)
- Selects NP antecedent of third person pronouns
- Re-implemented for German
- · Features and rules optimized manually

Advantages of rule-based AR systems Resolution of Anaphora Procedure **Two-Step Resolution Process** Feature Set and Salience Hierarchy

Two-Step Resolution Process

First step: candidate filtering

- Morphological filter
- Syntactic filter

Second step: resolution

- Assignment of a salience value to each candidate
- Dynamic update of salience values (w.r.t candidate's position and equivalence class membership)
- Selection of the candidate with the highest salience value

Advantages of rule-based AR systems Resolution of Anaphora Procedure Two-Step Resolution Process Feature Set and Salience Hierarchy

Feature Set and Salience Hierarchy

Feature	Weight
Syntactic features	
Subject emphasis	170
Accusative object emphasis	70
Dative object emphasis	50
Genitive object emphasis	50
Head noun emphasis	80
Parallelism reward	35
Positional features	
Short distance cataphora penalty	-80
Long distance cataphora penalty	-175
Current sentence reward	20

Basic Assumption Results Comparison to original Lappin and Leass

Experiments

Assumption

Performance of the resolution system increases when...

- helpful features are given higher weights
- not so helpful features are given lower weights

For each feature...

- ...reduce weight
- ...increase weight
- ... and each time, measure RAP's performance

Basic Assumption Results Comparison to original Lappin and Leass



- Syntax helps most
 - Grammatical function "subject" most important for correct resolution
 - But other grammatical functions less helpful
- Position less important
 - Low rewards for NPs in the current sentence
 - Relaxed penalization of cataphoric constructions

Basic Assumption Results Comparison to original Lappin and Leass

Comparison to original Lappin and Leass

- Positional features get much higher weights
 - Sentence recency
 - Cataphora highly penalized
- Syntactic features less promiment

But: Lappin and Leass use a very different text domain (computer manuals)

Summary Outlook



- Attempt to assess helpfulness of commonly used features for anaphora resolution in German
- Syntactic features (especially the subject) are the determining factors
- Positional features less important

Summary Outlook

Outlook

Where do differences in the importance of features accross language stem from?

- Domain-specific properties?
 - German newspaper text
- More general typological properties?
 - Free word order in German

Thank You