

Coreference Resolution

Lecture 15: October 30, 2013

CS886-2 Natural Language Understanding
University of Waterloo

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Reference Resolution

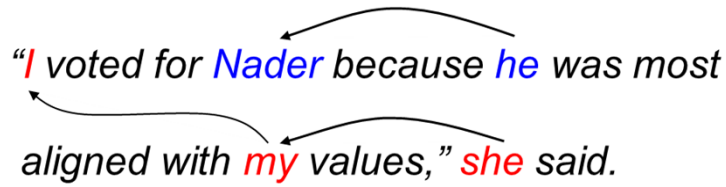
- Entities: objects, people, etc. that are being referred to in a text
- Named entities: entities referred to by a rigid designator (usually the most important entities)
- **Reference resolution**: task of determining what entities are referred to by which linguistic expressions

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Example

"I voted for Nader because he was most aligned with my values," she said.



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Coreference

- Referring expression (a.k.a. mention): natural language expression used to perform reference
 - Observed
- Referent: entity that is being referred to
 - Hidden
- **Coreference**: when two referring expressions refer to the same entity

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Anaphora

- **Antecedent**: term for a referring expression that licenses the use of another
- Reference to an entity that has been previously introduced into the discourse is called **anaphora** and the referring expression used is said to be **anaphoric**
- Example: John is smart. He solved the problem

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Coreference Resolution

- **Coreference resolution**: task of finding referring expressions in a text that refer to the same entity.
- **Pronominal anaphora resolution**: task of finding the antecedent for a single pronoun
 - Subtask of coreference resolution

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Two Views

- **Classification:** classify every pair of mentions as coreferent or not
 - Complexity: quadratic in # of mentions
 - Challenge: global consistency
- **Clustering:** partition mentions by entities
 - Global consistency more easily achieved
 - Challenge: complexity (exponentially many partitions)

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Referring Expressions (Mentions)

- Noun phrases
 - Indefinite
 - Definite
- Pronouns
 - Definite
 - Demonstrative
- Names

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Indefinite Noun Phrases

- **Indefinite** references introduce entities that are new to the reader
 - Often marked by “a”, “an”, “some” but may also be marked by “the”
- Examples:
 - Mrs. Martin was so kind as to send Mrs. Goddard a beautiful goose
 - He had gone around one day to bring her some walnuts
 - I saw this beautiful Ford Falcon today

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Definite Noun Phrases

- **Definite** references refer to an entity that is identifiable to the hearer because it has been mentioned previously
 - An entity may be identifiable even if it was not already mentioned because it is part of the hearer’s set of beliefs
- Examples:
 - It concerns a white stallion which I have sold to an officer, but the pedigree of the white stallion was not fully established
 - I read about it in the New York Times.

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Pronouns

- Another form of definite reference is pronominalization
 - E.g., Emma smiled and chatted as cheerfully as she could.
- NB: Pronouns can be used in **cataphora**, in which they are mentioned before their referents are
 - E.g. Even before she saw it, Dorothy had been thinking about Emerald City.

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Demonstrative Pronouns

- “this” and “that” are **demonstratives** that may be used alone or as determiners
 - This: proximal demonstrative
 - That: distal demonstrative
- Example
 - I just bought a copy of Thoreau’s Walden. I had bought one five years ago. That one had been very tattered; this one was in much better condition.

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Names

- **Names** are a common form of referring expression, including names of people, organizations and locations
- Example
 - International Business Machines sought patent compensation from Amazon; IBM had previously sued other companies.

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Features

- Number agreement
- Person agreement
- Gender agreement
- Binding constraints
- Preferences in pronoun interpretation
 - Recency, grammatical role, repeated mention, parallelism, verb semantics, selectional restrictions

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