Koreferenzresolution mit BART

Spezifikationsvortrag zum Softwareprojekt im Sommersemester 2014

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Inhalt

Problematik: Koreferenz

***John Simon**, **Chief Financial Officer of Prime Corp** **since 1986** saw **his** pay jump 20 percent, to 1.3 million dollar, as **the 37-year-old** also became **the financial service company's president**.*[1]

- Unterschiedliche Beschreibungen beziehen sich auf gleiche Entitäten
  - John Simon
  - he
  - the 37-year-old

[1] Beispiele von Yannick Versley

Anwendungen: Information Extraction

Towards the end of the war, under extreme pressure from the Nazi Party, ***Furtwängler*** *fled to Switzerland. [...]*
He *died in 1954 in Ebersteinburg close to Baden-Baden.*

Q: Wann starb Furtwängler?

→ Wie kann man Koreferenz auflösen?

BART

- Beautiful Anaphora Resolution Toolkit
- Entstanden im Projekt
  Exploiting Lexical and Encyclopedic Resources For Entity Disambiguation im John Hopkins Summer Workshop 2007
- System für automatische Koreferenzresolution
- Weiterentwicklungen im Rahmen von shared tasks, für verschiedene Sprachen (Italienisch, Chinesisch)

Wie funktioniert BART?

- Modularer Aufbau:
- Vorverarbeitungsphase
- Extraktion NP- Kandidaten, NP- Merkmale, Kandidatenpaare

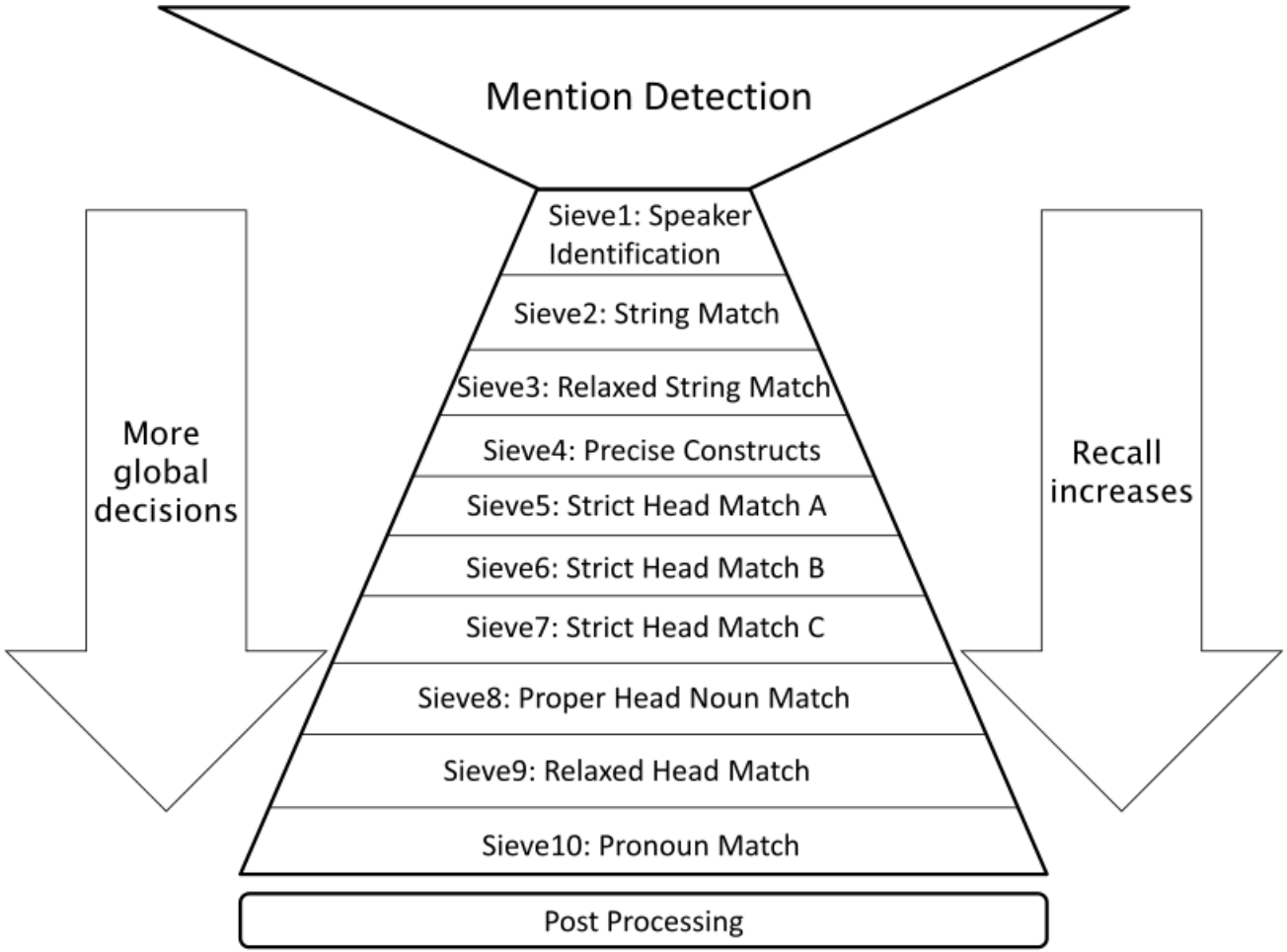
Wie funktioniert BART?

- Resolution mit Soon Algorithmus
- Kandidatenpaare werden paarweise anhand ihrer Merkmale verglichen
- Ergebnisse

Problemstellung

- Koreferenzresolution in BART mit neuem Ansatz:
  - Vorwiegend regelbasiertes System der Stanford-NLP-Gruppe
  - Bestes Ergebnis bei CoNLL-2011 shared task
  - Adaptiert für Chinesisch, Arabisch

Aufbau des Stanford Systems



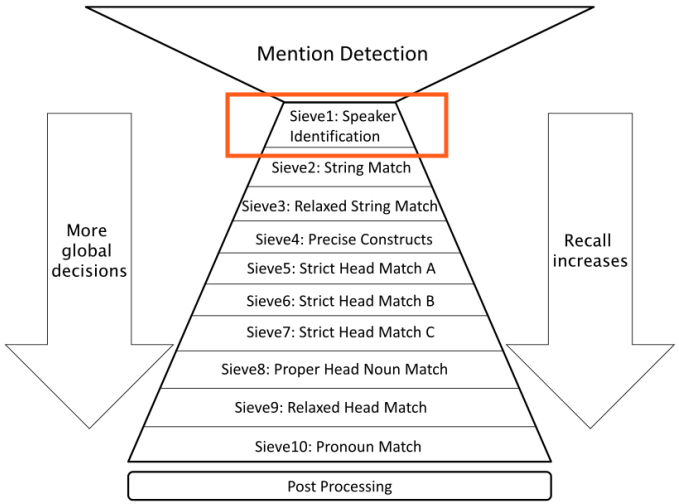
Input + Mention Detection

Beispielsatz:

> *John is a musician. He played a new song. A girl was listening to the song. "It is my favorite," John said to her.*

$[\text{John}]_1^1$ is $[\text{a musician}]_2^2$. $[\text{He}]_3^3$ played $[\text{a new song}]_4^4$.
$[\text{A girl}]_5^5$ was listening to $[\text{the song}]_6^6$.
"$[\text{It}]_7^7$ is $[[\text{my}]_9^9$ favorite$]_8^8$," $[\text{John}]_{10}^{10}$ said to $[\text{her}]_{11}^{11}$.

Speaker Identification



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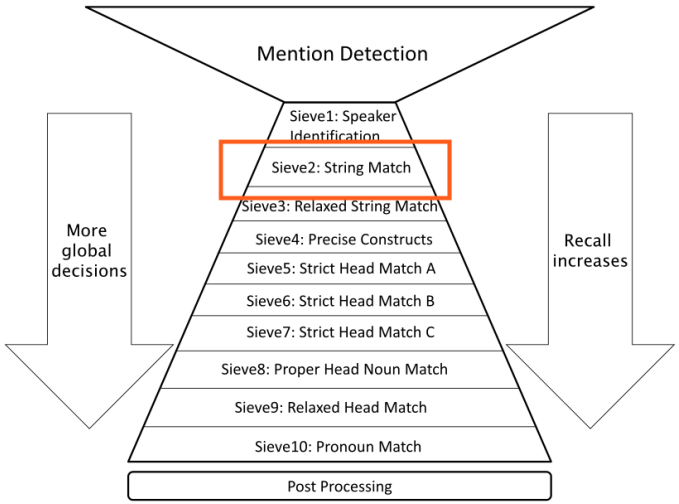
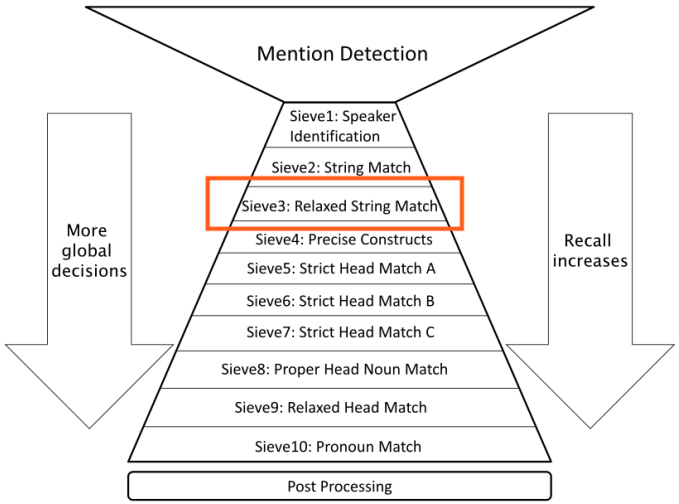
$[\text{A girl}]_5^5$ was listening to $[\text{the song}]_6^6$.
"$[\text{It}]_7^7$ is $[[\textbf{my}]_9^9$ favorite$]_8^8$," $\textbf{[John]}_{10}^9$ said to $[\text{her}]_{11}^{11}$.

String Match



[John]$^{1}_{1}$ is [a musician]$^{2}_{2}$. [He]$^{3}_{3}$ played [a new song]$^{4}_{4}$.
[A girl]$^{5}_{5}$ was listening to [the song]$^{6}_{6}$.
"[It]$^{7}_{7}$ is [[my]$^{1}_{9}$ favorite]$^{8}_{8}$," **[John]**$^{1}_{10}$ said to [her]$^{11}_{11}$.

Relaxed String Match



$[\text{John}]_1^1$ is $[\text{a musician}]_2^2$. $[\text{He}]_3^3$ played $[\text{a new song}]_4^4$.
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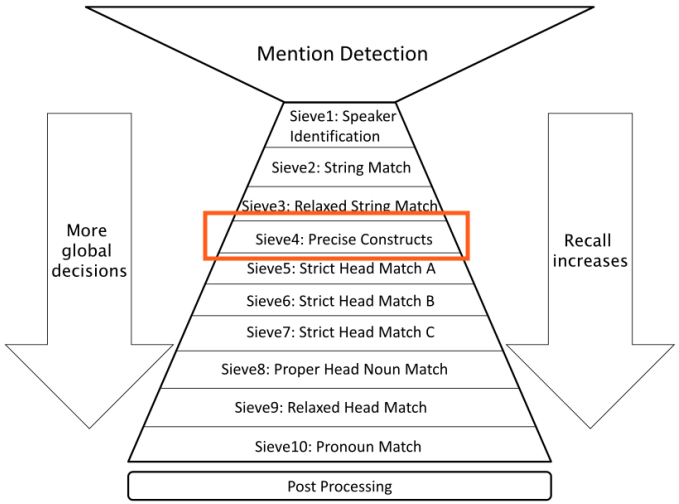
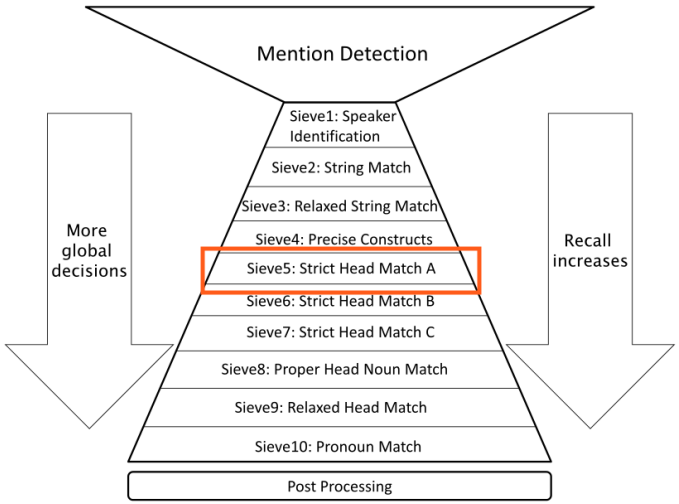
Precise Constructs



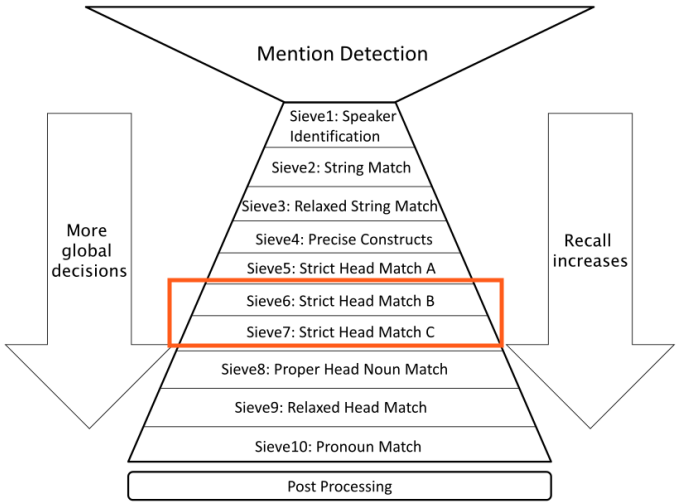
[John]$^1_1$ is **[a musician]**$^1_2$. [He]$^3_3$ played [a new song]$^4_4$.
[A girl]$^5_5$ was listening to [the song]$^6_6$.
"**[It]**$^7_7$ is **[[my]**$^1_9$ **favorite]**$^7_8$," [John]$^1_{10}$ said to [her]$^{11}_{11}$.

Strict Head Match A



$[\text{John}]_1^1$ is $[\text{a musician}]_2^1$. $[\text{He}]_3^3$ played **[a new song]**$_4^4$.
$[\text{A girl}]_5^5$ was listening to **[the song]**$_6^4$.
"$[\text{It}]_7^7$ is $[[\text{my}]_9^1$ favorite$]_8^7$," $[\text{John}]_{10}^1$ said to $[\text{her}]_{11}^{11}$.

Strict Head Match B C



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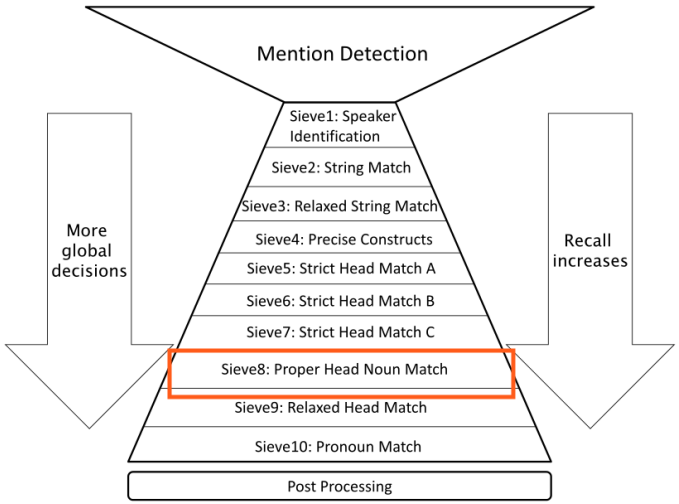
Proper Head Noun Match



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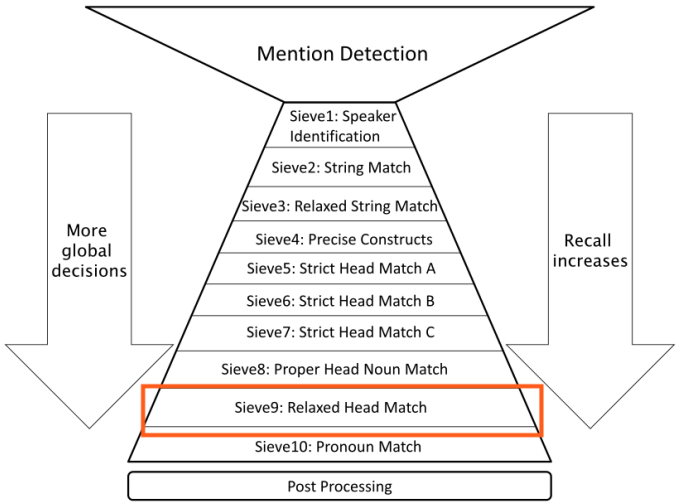
"$[\text{It}]_7^7$ is $[[\text{my}]_9^1$ favorite$]_8^7$," $[\text{John}]_{10}^1$ said to $[\text{her}]_{11}^{11}$.

Relaxed Head Match



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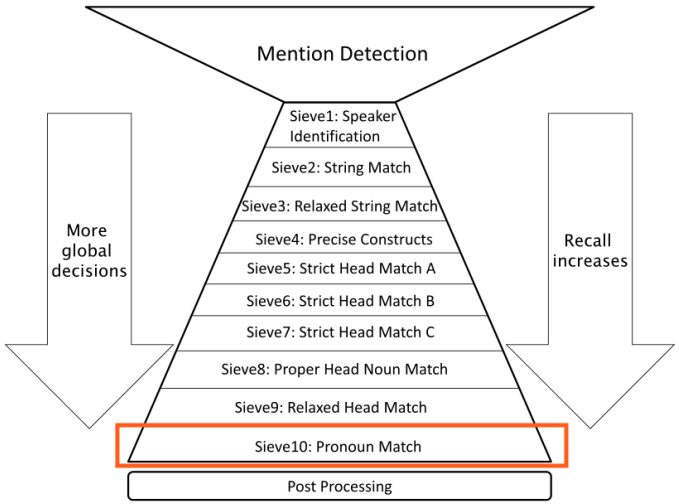
$[\text{A girl}]_5^5$ was listening to $[\text{the song}]_6^4$.
"$[\text{It}]_7^7$ is $[[\text{my}]_9^1$ favorite$]_8^7$," $[\text{John}]_{10}^1$ said to $[\text{her}]_{11}^{11}$.

Pronoun Match



[John]$^1_1$ is [a musician]$^1_2$. **[He]**$^1_3$ played [a new song]$^4_4$.
[A girl]$^5_5$ was listening to **[the song]**$^4_6$.
"**[It]**$^4_7$ is [[my]$^1_9$ favorite]$^4_8$," [John]$^1_{10}$ said to **[her]**$^5_{11}$.

Post Processing + Final Output

$[\text{John}]_1^1$ is **a musician**. $[\text{He}]_3^1$ played $[\text{a new song}]_4^4$.
$[\text{A girl}]_5^5$ was listening to $[\text{the song}]_6^4$.
"$[\text{It}]_7^4$ is **[my]$_9^1$ favorite**," $[\text{John}]_{10}^1$ said to $[\text{her}]_{11}^5$.

$[\text{John}]_1^1$ is a musician. $[\text{He}]_3^1$ played $[\text{a new song}]_4^4$.
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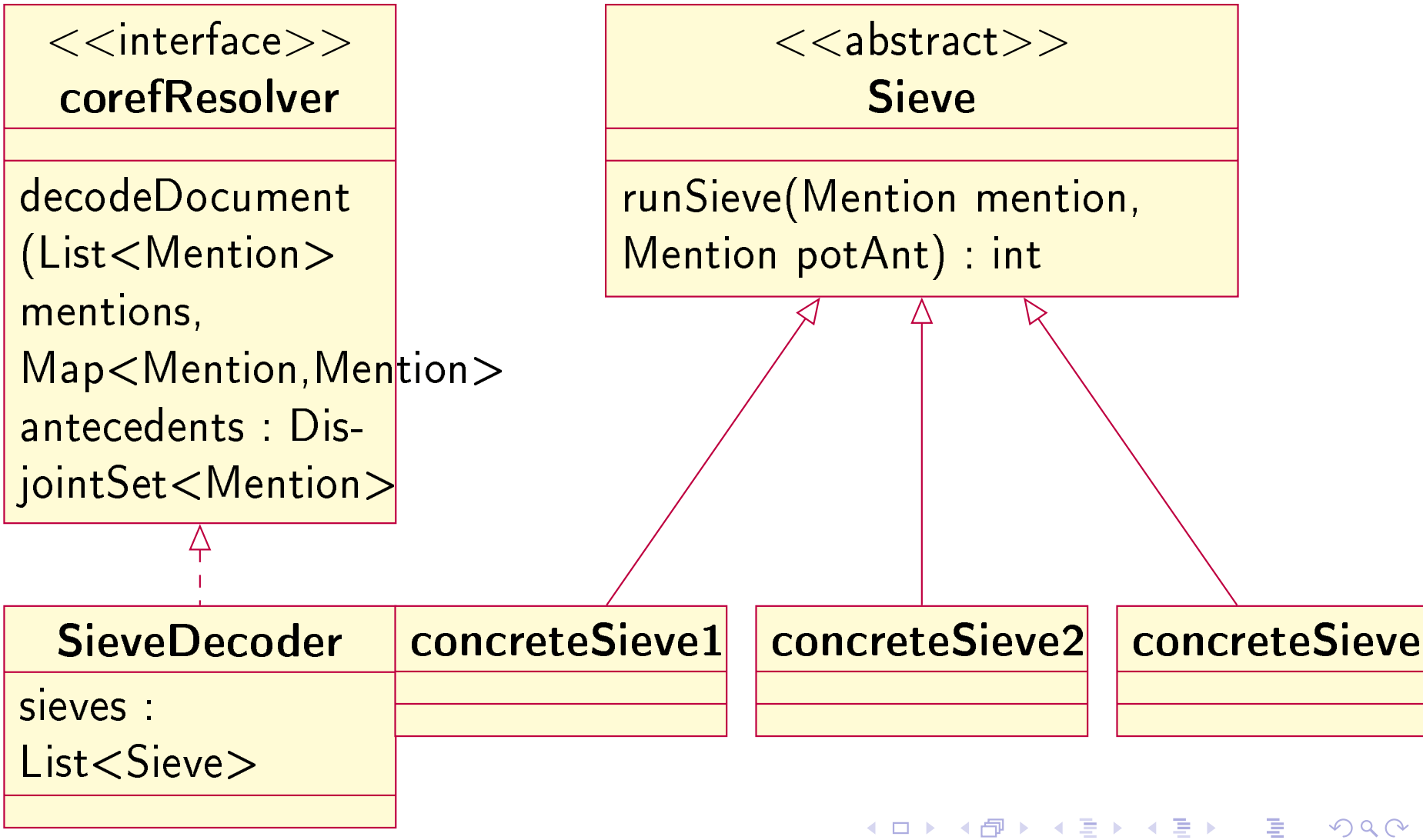
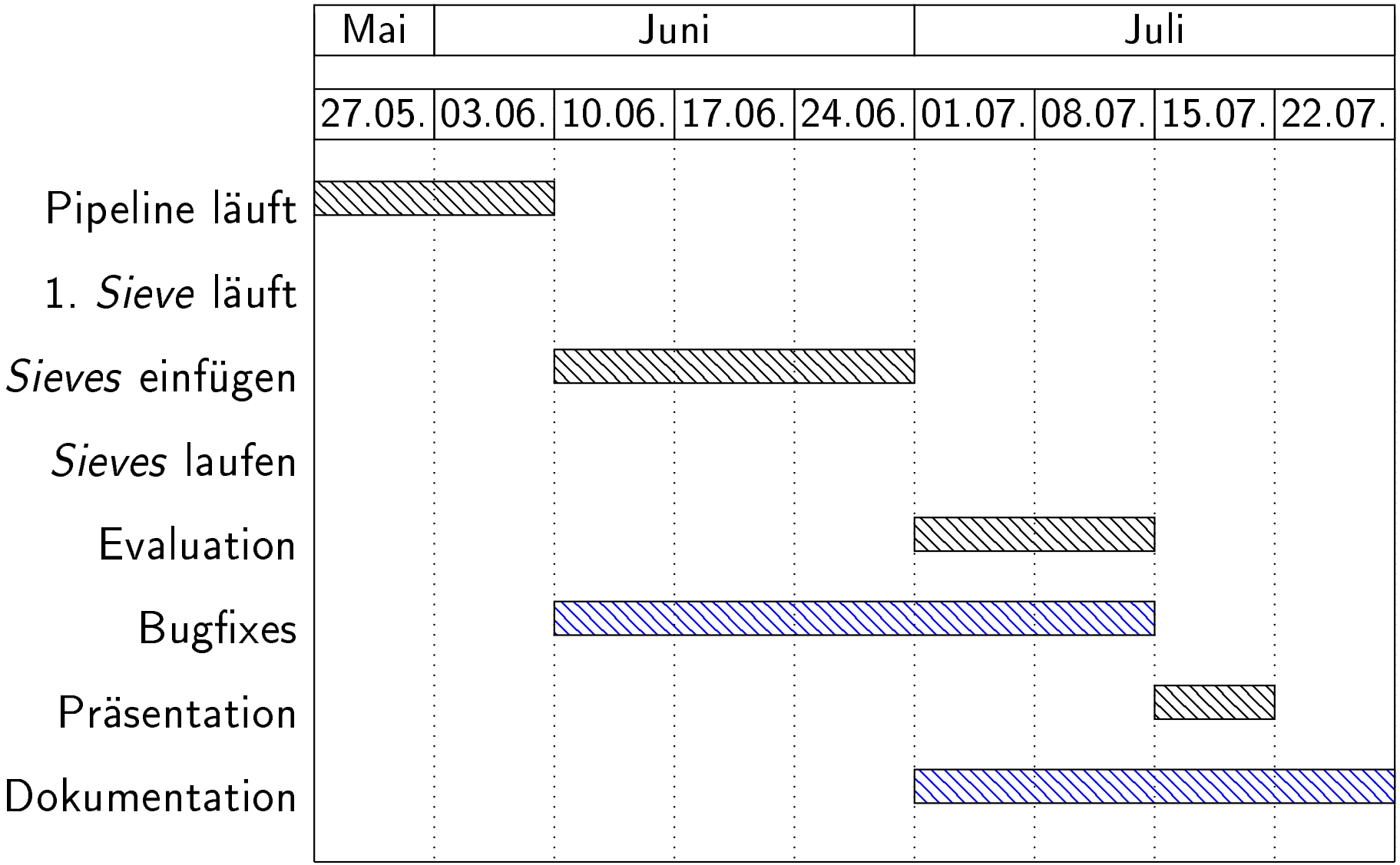
"$[\text{It}]_7^4$ is $[\text{my}]_9^1$ favorite," $[\text{John}]_{10}^1$ said to $[\text{her}]_{11}^5$.

Generelle Architektur



Discourse Entity

DiscourseEntity
mentions : set<Mention> nextID : int discourseID : ID genders : set<Gender> numbers : set<G words : set<String> heads : set<String> firstMention : Mention representativeMention : Mention
DiscourseEntity(Mention m) mergeEntities(Mention m) : void getMostRepresentativeMention() : void


Mai
Juni
Juli
27.05.
03.06.
10.06.
17.06.
24.06.
01.07.
08.07.
15.07.
22.07.
Pipeline läuft
1. *Sieve* läuft
Sieves einfügen
Sieves laufen
Evaluation
Bugfixes
Präsentation
Dokumentation

Aufgabenverteilung

bis 10.06.: Aufteilung der Pipeline

- *DiscourseEntity*: Julian Baumann
- *Sieve & StringMatchSieve*: Xenia Kühling
- *SieveDecoder*: Sebastian Ruder

ab 10.06.: Aufteilung der *Sieves*

- *RelaxedStringMatchSieve*, *PreciseConstructsSieve*, (*SpeakerIdentificationSieve*)
- *StrictHeadMatch[ABC]Sieve*, *RelaxedHeadMatch*
- *ProperHeadNounMatch*, *PronounMatch*

Softwarespezifikation

- Datenformate
  - MMAX2, Java, .config
- BART-Version: Klon von Yannicks bitbucket *repository* (`https://bitbucket.org/yannick/bart`); Stand 05.05.14
- Korpora
  - TüBA-D/Z 2008 MMAX2 (Deutsch)
  - Penn Treebank (Englisch)
  - Turin University Treebank/ISST (Italienisch)
- Programmierumgebung
  - Eclipse 4.3.2 mit IvyDE (*dependency management*) sowie EGit und GitHub zur Versionskontrolle

Quellen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