HeidelTime as
A Baseline Temporal Tagger for All Languages

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Temporal Tagging

Tasks
- extraction of temporal expressions
- normalization of temporal expressions

Most approaches
- focus on English
- focus on news-style texts

Main challenges [1]
- different domains, different challenges
- normalizing non-explicit expressions, e.g., *today*, *Monday*, *next week*, *July*
- only few languages addressed so far

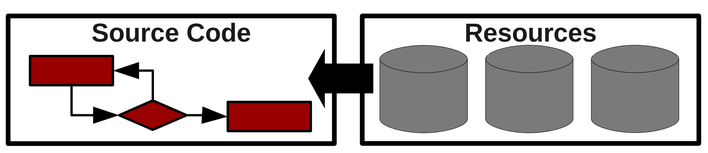
Multilingual temporal tagging
- annotated corpora in several languages
- few multilingual temporal taggers
- earlier works on automatic extensions to new languages less successful

So far: temporal tagging of many languages never addressed!

HeidelTime

Key features [1]
- rule-based system
- multilingual and domain-sensitive

Architecture
- language-independent, domain-specific normalization strategies
- language-dependent resources
- required: sentence, token, pos information



HeidelTime's Language Resources

(i) pattern files

```
// reMonthLong
[Ee]nero
[Ff]ebrero
[Mm]arzo
...
```

(ii) normalization files

```
// "normMonth"
"[Ee]nero","01"
"[Ee]ne\.?","01"
"0?1","01"
"[Ff]ebrero","02"
...
```

(iii) rules

```
// example: "el 20 de enero de 2012" (2012-01-20)
Name="date_r1"
Extract="[Ee]l %reDayNum de %reMonthLong de %reYear4Digit"
Value="group(3)-%normMonth(group(2))-%normDay(group(1))"
```

Extraction
- regexes, pos constraints and (i)

Normalization
- linguistic clues, tense and (ii)

Manual Extension to Languages

Procedure [2]
- linguistic preprocessing
- based on source language (English):
  1. manual translation of pattern and normalization files
  2. iterative rule development
  3. error analysis based improvements on annotated data (target language)

Disadvantages
- time- and labor-intensive
- language expert required

Automatic Extension of HeidelTime to All Languages

Strategy
- avoid language dependency

→ generic, simple sentence/token splitter

→ no pos tagger
- language-independent (A,C) and English translation-amendable (B) resources

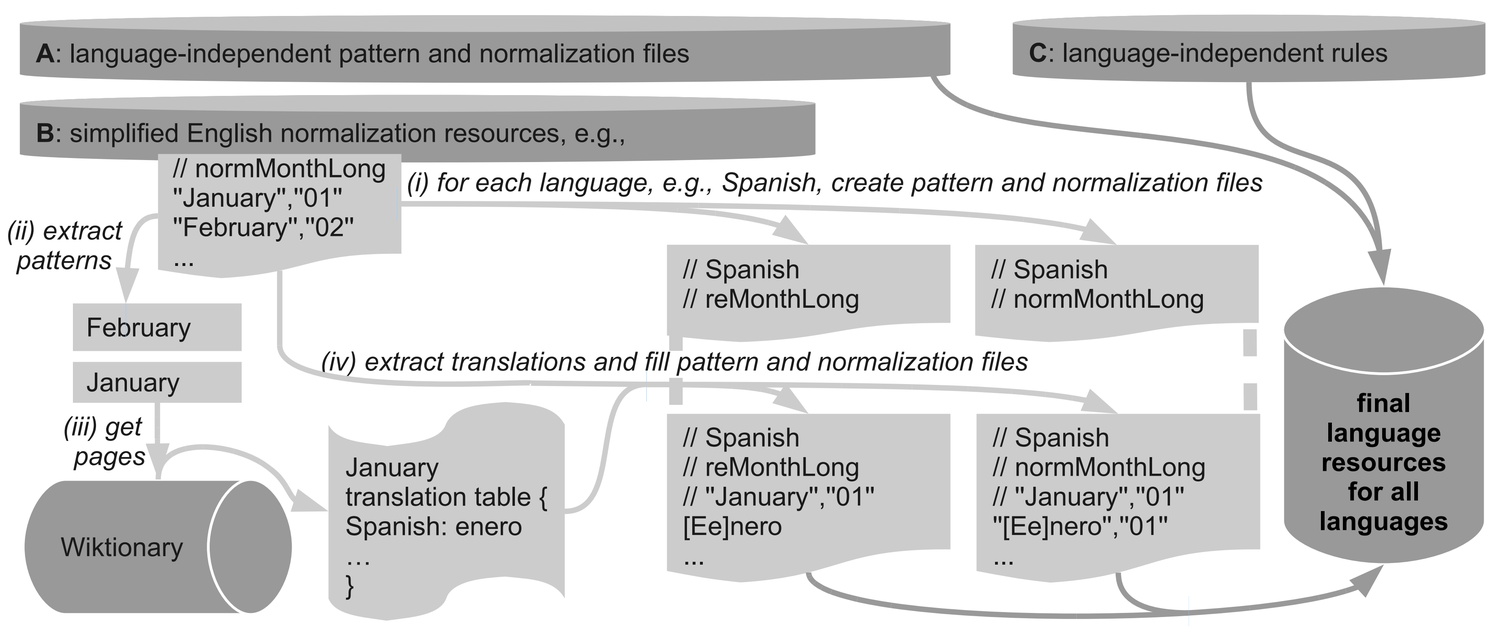
(A) → usable for all languages

(B) → to automatically create pattern and normalization files for all languages

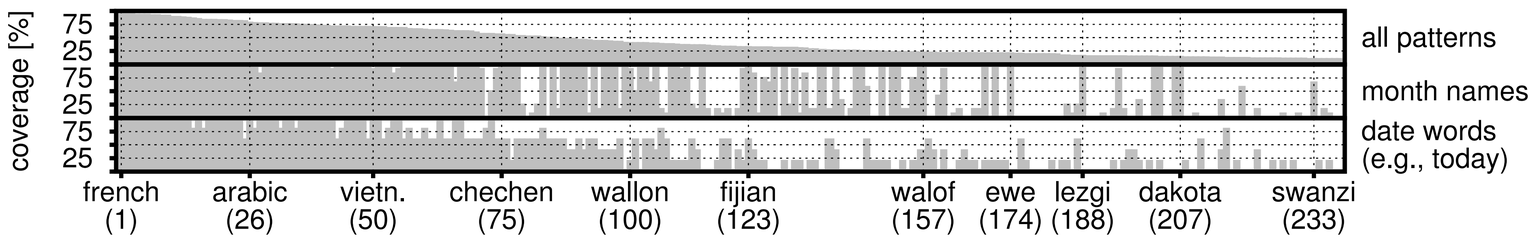
(C) → rules without pos constraints and language-specific terms

→ 'creative' rules with wildcards

→ iterative improvements of (A,B,C) based on English annotated corpora



Coverage and Evaluation



Evaluation
- annotated corpora of 10 languages
- comparison with manual HeidelTime → manual resources work better
- results depend on Wiktionary coverage, language characteristics (morphology richness, token boundaries, ...)

→ promising results for first baselines

Ongoing Work
- further translation resources
- more language-independent rules
- further fuzzy matching rules
- non-whitespace token boundaries

Availability

HeidelTime 2.0 at GitHub
- 13 languages (manual resources)
- 200+ languages (automatic resources)
- UIMA component
- Java standalone
- online demo

HeidelTime as temporal tagging baseline and starting point for 200+ languages!

References

[1] J. Strötgen and M. Gertz: **Multilingual and Cross-domain Temporal Tagging.** *Language Resources and Evaluation*, 47(2), 269–298, 2013.

[2] J. Strötgen et al.: **Time for More Languages: Temporal Tagging of Arabic, Italian, Spanish, and Vietnamese.** *ACM Transactions on Asian Language Information Processing (TALIP)*, 13(1), 1-21, 2014.

This work was presented at EMNLP 2015, September 17–21, 2015, Lisbon, Portugal.

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EMNLP 2015 CONFERENCE ON EMPIRICAL METHODS IN NATURAL LANGUAGE PROCESSING LISBON