

Task 1: Manual Annotation

The following three sentences were extracted from the Wikipedia page about Edward Snowden¹. Mark the named entities and time expressions in these sentence and insert them into the table.

For time normalization, express each time expression as an interval in the following format: “[yyyy-MM-dd,yyyy-MM-dd]” (e.g. “[2018-04-19,2018-04-26]”).

- 1:** In 2013, Snowden was hired by an NSA contractor, Booz Allen Hamilton, after previous employment with Dell and the CIA.
- 2:** On May 20, 2013, Snowden flew to Hong Kong after leaving his job at an NSA facility in Hawaii, and in early June he revealed thousands of classified NSA documents to journalists Glenn Greenwald, Laura Poitras, and Ewen MacAskill.
- 3:** Snowden came to international attention after stories based on the material appeared in The Guardian and The Washington Post.

Sent. No.	Entity	Entity Type ²	Time Expression	Time Expression (normalized)
1	Edward Snowden NSA Booz Allen Hamilton DELL CIA	PER ORG PER ORG ORG	2013	[2013-01-01, 2013-12-31]
2	Edward Snowden Hong Kong NSA Hawaii NSA Glenn Greenwald Laura Poitras Ewen MacAskill	PER LOC ORG LOC ORG PER PER PER	May 20, 2013 early June	[2013-05-20] [2013-06-01, 2013-06-10] ³
3	Edward Snowden The Guardian The Washington Post	PER ORG ORG		

¹ https://en.wikipedia.org/w/index.php?title=Edward_Snowden&oldid=836189168

² ORG: Organization, LOC: Location, PER: Person

³ This decision for a time interval representing “early June” is ambiguous.

Task 2: Extraction Tools

Insert the text from Task 1 into the following tools and insert their output into the table:

Entity Linking

- DBpedia Spotlight: <http://demo.dbpedia-spotlight.org/>
- Babelify: <http://babelify.org/>

Temporal Taggers

- SUTime: <http://nlp.stanford.edu:8080/sutime/>
- Heideltime: <http://heideltime.ifi.uni-heidelberg.de/heideltime>

	DBpedia Spotlight	Babelify	SUTime	HeidelTime
Sent. No.	Entity	Entity	Time Expression (normalized)	Time Expression (normalized)
1	Edward Snowden NSA Booz Allen Hamilton DELL CIA	Booz Allen Hamilton	[2013-01-01,2013-12-31]	[2013-01-01,2013-12-31]
2	Edward Snowden Hong Kong NSA Hawaii NSA Glenn Rhee Laura Poitras Ewen MacAskill	May 20 Hong Kong Hawaii Glenn Greenwald Laura Poitras Ewen MacAskill	[2013-05-20,2013-05-20] [2017-06-01,2017-06-30]	[2013-05-20,2013-05-20] [2013-06-01,2013-06-30] ⁴
3	Edward Snowden Emmy Award The Guardian The Washington Post	The Guardian The Washington Post		

2.1 Which input options do you have when using the HeidelTime demo?

Use the annotation for "Document Type: Narratives".

2.2 What are the differences between the DBpedia Spotlight and Babelify output?

Babelify extracts concepts and named entities. Some annotations are erroneously extracted as concepts (e.g., NSA). DBpedia Spotlight finds more named entities, but some of them are wrong.

2.3 What are the differences between the SUTime and HeidelTime output?

SUTime maps "early June" to the most recent June (in 2017), as there is no year available. With the "narratives" option, HeidelTime extracts the correct year.

Task 3: Precision and Recall

⁴ Due to the difficulty with defining a time interval for "early June", we mark this as a correct extraction.

Compare the results from Task 2 to your manual annotation in Task 1. Insert the numbers of correctly extracted, wrongly extracted and missing annotations into the following table. Compute the precision and recall scores as well as the F-measure of each extractor (see repetition).

	#correct	#wrong	#missing	Precision	Recall	F-measure
DBpedia Spotlight	5+7+3 = 15	0+1+1 = 2	0+1+0 = 1	$\frac{15}{15+2} \approx 0.88$	$\frac{15}{15+1} \approx 0.94$	$2 \cdot \frac{0.88 \cdot 0.94}{0.88+0.94} \approx 0.91$
Babelify	1+5+2 = 8	0+1+0 = 1	4+3+1 = 8	$\frac{8}{8+1} \approx 0.88$	$\frac{8}{8+8} = 0.5$	$2 \cdot \frac{0.88 \cdot 0.5}{0.88+0.5} \approx 0.64$
SUTime	1+1+0 = 2	0+0+1 = 1	0+0+1 = 1	$\frac{2}{2+1} \approx 0.67$	≈ 0.67	$2 \cdot \frac{0.67 \cdot 0.67}{0.67+0.67} \approx 0.67$
Heidel-Time	1+2+0 = 3	0+0+0 = 0	0+0+0 = 0	$\frac{3}{3+0} = 1$	$\frac{3}{3+0} = 1$	$2 \cdot \frac{1 \cdot 1}{1+1} = 1$

Repetition: Precision and Recall

Precision: Proportion of correctly extracted annotations among all extracted annotations.

$$Precision = \frac{|\{correct\ annotations\}|}{|\{correct\ annotations\} \cup \{wrong\ annotations\}|}$$

Recall: Proportion of annotations found by the algorithm to all annotations in the collection.

$$Recall = \frac{|\{correct\ annotations\}|}{|\{correct\ annotations\} \cup \{missing\ annotations\}|}$$

F-measure: The weighted harmonic mean of precision and recall.

$$F_1 = 2 \cdot \frac{Precision \cdot Recall}{Precision + Recall}$$

More Information

- SUTime: <https://nlp.stanford.edu/software/sutime.shtml>
- Stanford CoreNLP: <https://stanfordnlp.github.io/CoreNLP/>
- Ollie: <https://knowitall.github.io/ollie/>