**Task 1: Manual Annotation**

The following three sentences were extracted from the Wikipedia page about Edward Snowden\(^1\). 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.


<table>
<thead>
<tr>
<th>Sent. No.</th>
<th>Entity</th>
<th>Entity Type(^2)</th>
<th>Time Expression</th>
<th>Time Expression (normalized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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\(^2\) ORG: Organization, LOC: Location, PER: Person, MISC: Miscellaneous
### Task 2: Extraction Tools

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

**Entity Linking**

**Temporal Taggers**
- Heideltime: [http://heideltime.ifi.uni-heidelberg.de/heideltime](http://heideltime.ifi.uni-heidelberg.de/heideltime)

<table>
<thead>
<tr>
<th>Sent. No.</th>
<th>DBpedia Spotlight</th>
<th>Babelfy</th>
<th>SUTime</th>
<th>HeidelTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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

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

2.3 What are the differences between the SUTime and HeidelTime output?
Task 3: Precision and Recall

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).

<table>
<thead>
<tr>
<th></th>
<th>#correct</th>
<th>#wrong</th>
<th>#missing</th>
<th>Precision</th>
<th>Recall</th>
<th>F-measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBpedia Spotlight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Babelfy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUTime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heidel-Time</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Task 3: Natural Language Processing

3.1 Insert the text from Task 1 into the Stanford Core NLP demo: [http://corenlp.run/](http://corenlp.run/).

3.2 What types of output are returned?

3.3 What is the difference between Named Entity Recognition (NER) and Entity Linking (EL)?

Task 4: Relation Extraction

4.1 Use Ollie to annotate the text from Task 1: [https://github.com/knowitall/ollie](https://github.com/knowitall/ollie) (Section “Local Machine”).

4.2 Describe the output and list the most important advantages and disadvantages.
Repetition: Precision and Recall

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

\[
Precision = \frac{|\{\text{correct annotations}\}|}{|\{\text{correct annotations}\} \cup \{\text{wrong annotations}\}|}
\]

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

\[
Recall = \frac{|\{\text{correct annotations}\}|}{|\{\text{correct annotations}\} \cup \{\text{missing annotations}\}|}
\]

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](https://nlp.stanford.edu/software/sutime.shtml)
- Stanford CoreNLP: [https://stanfordnlp.github.io/CoreNLP/](https://stanfordnlp.github.io/CoreNLP/)