# Type inference in Dbpedia from free text

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#### Motivation

- New DBpedia resource types extraction
- Type/hypernym discovering from resources without infobox or mapping rules

dbpedia:Dublin\_City\_Cup rdf:type dbpedia-owl:Event #new type

Find more specific DBpedia types

dbpedia:Angela\_Merkelrdf:typedbpedia-owl:Person#mapping-based typedbpedia:Angela\_Merkelrdf:typedbpedia-owl:Chancellor#more specific discovered type

- Extract types/hypernyms from plain text
- Provide datasets with newly discovered DBpedia types and evaluation
- Provide a hypernym discovery tool for local DBpedia chapters to acquire new types

### Outline

- LHD 1.0: identifies the hypernym word from the first sentence of the short abstract and maps it to a DBpedia resource
  - Language dependent process
  - POS Tagger and user-defined grammar are required
- LHD 2.0 STI classifier: inferring DBpedia ontology types based on co-occurence of LHD 1.0 and DBpedia types
- hSVM classifier: inferring types based on machine learning over bag of words
  - Language independent approach
- Evaluation on a large crowdsourced dataset

### STI classifier

Extract a hypernym word from the first sentence
 TreeTagger + Gate

Havel was a Czech **playwright**, essayist, poet, dissident and politician.

- Map the hypernym word to a DBpedia resource
  dbp:Playwright
- Get their DBpedia types along with frequency

Comedian:1, ... OfficeHolder:7, .., Writer:266, Artist:277, Person:521

Remove the supertypes, balancing specificity and reliability

Comedian:1, ... OfficeHolder:7, .., Writer:266, Artist:277, Person:521

- Select the type with highest support
  - dbpedia-owl:Writer

Language dependent approach !!!

# hSVM classifier

- Each resource is represented with two bagof-words models
  - BOW1 based on short abstract
  - BOW2 based on article categories
- Classification models are trained by SVM with mapping-based resources
- 3 layers of SVM classifiers = 58 SVM classifiers



# hSVM classifier

- Each SVM model returns an assignment confidence
- Supertype confidence is propagated to its subtypes as well
- We define 3 strategies to determine the final type
  - α strategy assigns with maximum confidence from all specific types (leaf types)
  - β strategy assigns type with maximum confidence from all types
  - $\circ \ \gamma$  strategy combines  $\alpha$  and  $\beta$  strategies

Language independent approach !!!

### Evaluation

- Evaluation on a crowdsourced dataset
- Each entity was typically annotated by three to four annotators
- 1021 entities with a DBpedia type in the gold standard
- Evaluation of
  - 1. STI language dependent approach
  - 2. hSVM language independent approach
  - 3. STI + hSVM fusion
  - 4. Mapping-based types dataset
  - 5. SDType Mapping-based types (Heuristic) dataset
    - heuristic link-based type inference mechanism

#### Results

Classier	Acc <sub>Exact</sub>	Acc <sub>Supertypes</sub>	Acc <sub>[Sub Super]types</sub>
STI	.375	.456	.643
hSVM	.350	.725	.768
STI+hSVM	.468	.831	.856
SDType	.337	.706	.775
DBpedia (mapping-based)	.374	.856	.920

### Conclusion

- STI/hSVM vs SDType
  - Type intersection is not so large
  - STI/hSVM is more specific
  - Use both STI/hSVM and SDType to discover new DBpedia types
- STI language dependent (now only for English, German and Dutch)
- hSVM language independent (available for all DBpedia chapters)
- The newest tool and datasets will be available very soon; publication is under review
- Watch our website
  - <u>http://ner.vse.cz/datasets/linkedhypernyms/</u>

#### Thank you for your attention

http://ner.vse.cz/datasets/linkedhypernyms/

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