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_Merkel	rdf:type	dbpedia-owl:Person	#mapping-based type
dbpedia:Angela_Merkel	rdf:type	**dbpedia-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

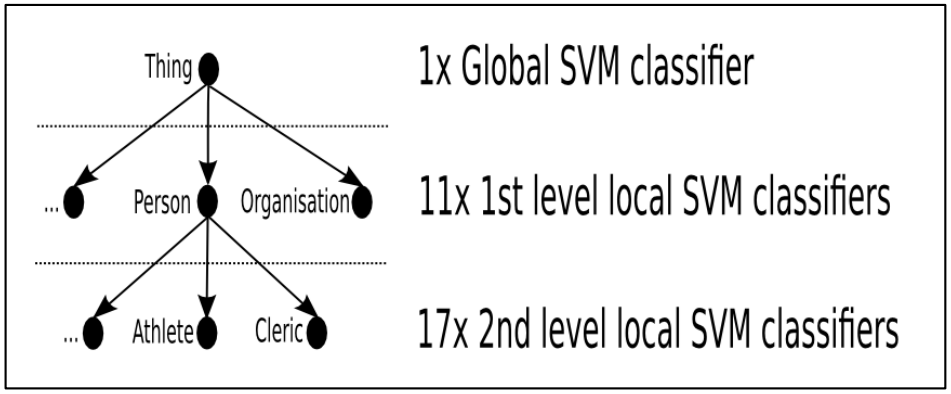
> Comedian:1, … OfficeHolder:7, .., Writer:266, ~~Artist:277, Person:521~~

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

Language dependent approach !!!

hSVM classifier

- Each resource is represented with two **bag-of-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
  - γ strategy combines α and β 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_{Exact}	$Acc_{Supertypes}$	$Acc_{[Sub\|Super]types}$
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
  - http://ner.vse.cz/datasets/linkedhypernyms/

Thank you for your attention

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

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