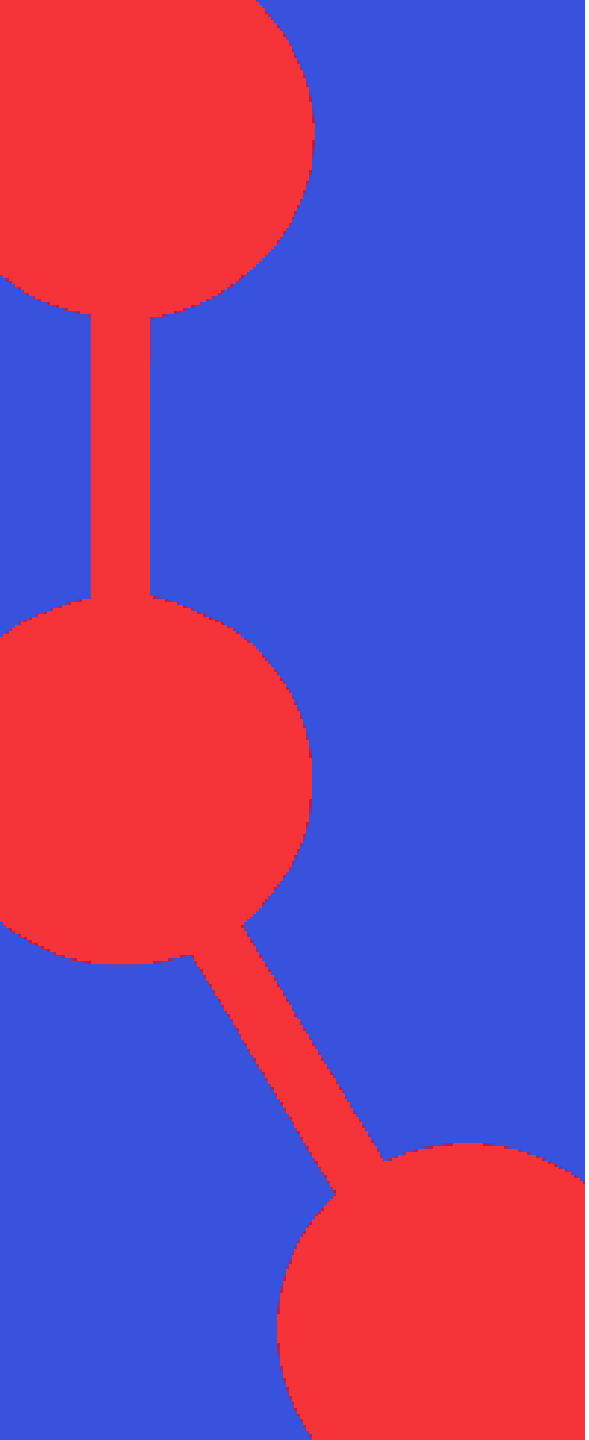

Preliminary Results in Tag Disambiguation using DBpedia

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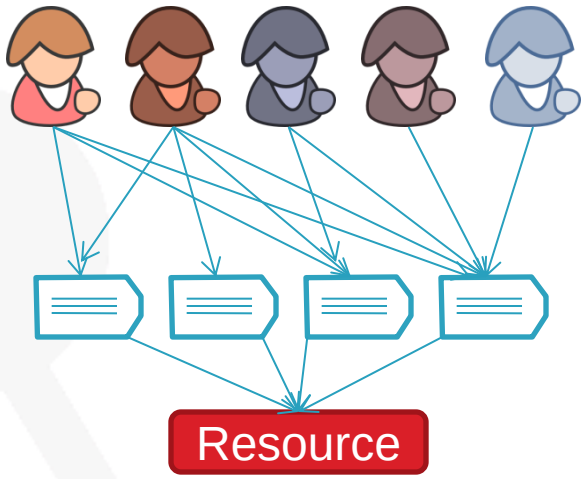
Table of Contents

Table of Contents

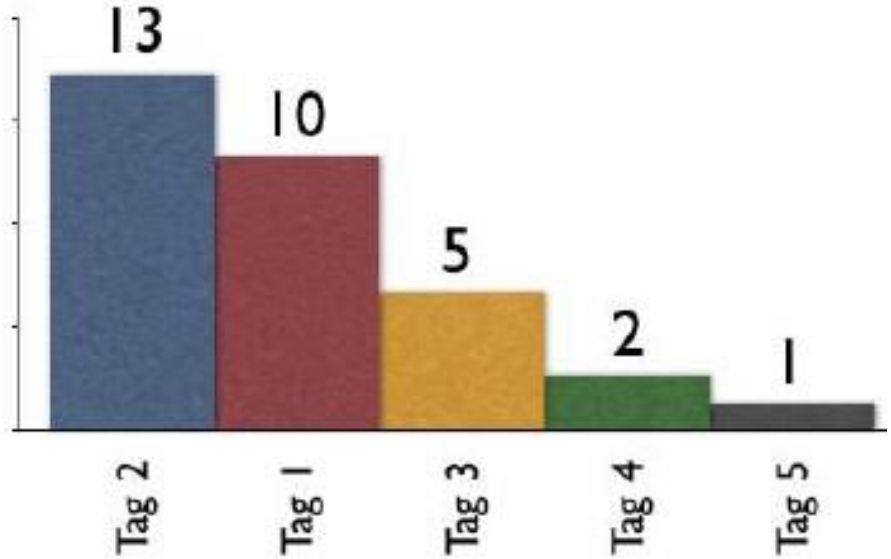
- Folksonomy*
  - The result of free tagging information and objects for one´s own retrieval (Anything with an URL)
  - Tagging is done in a social environment
  - People use their own vocabulary

* http://www.vanderwal.net/folksonomy.html

Broad folksonomy*

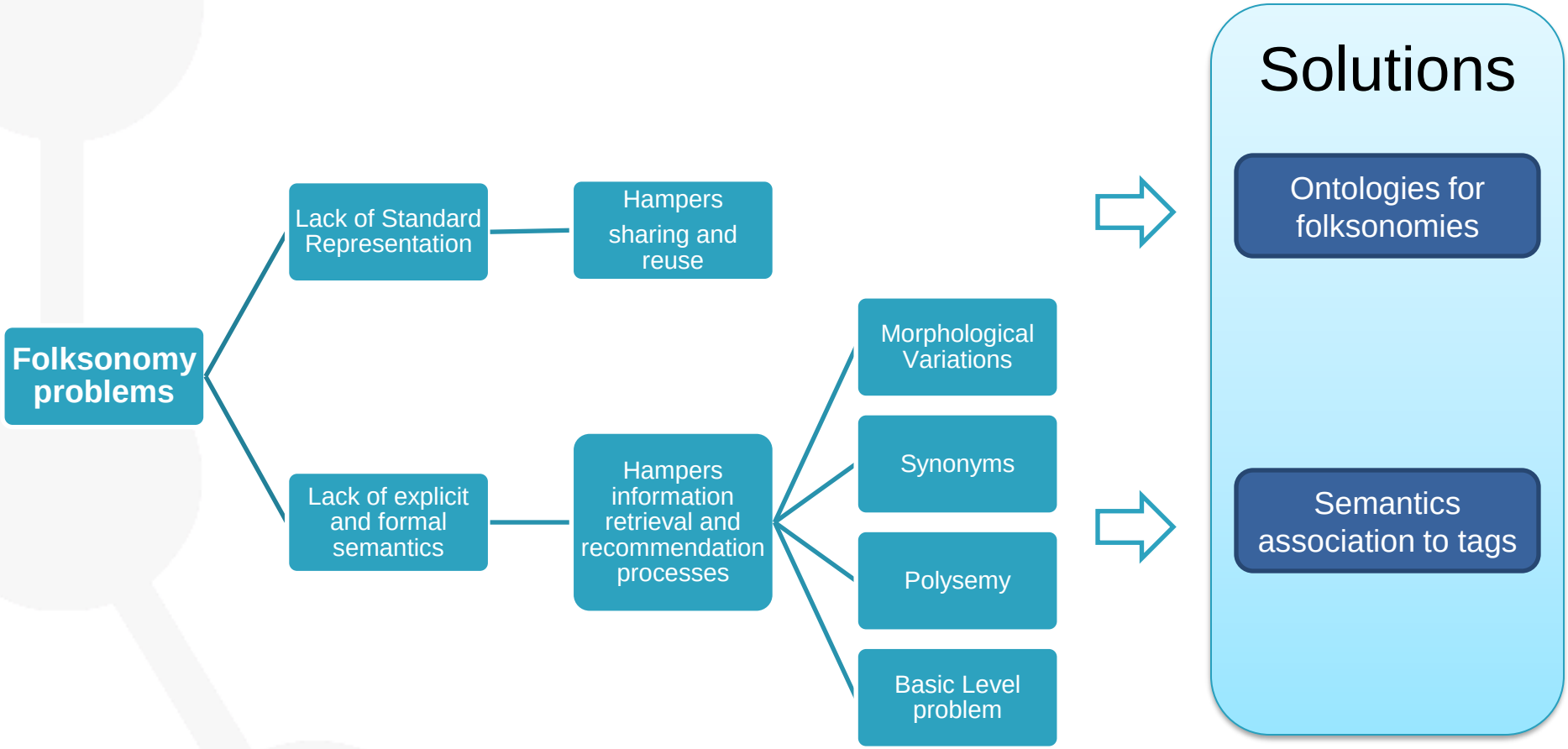


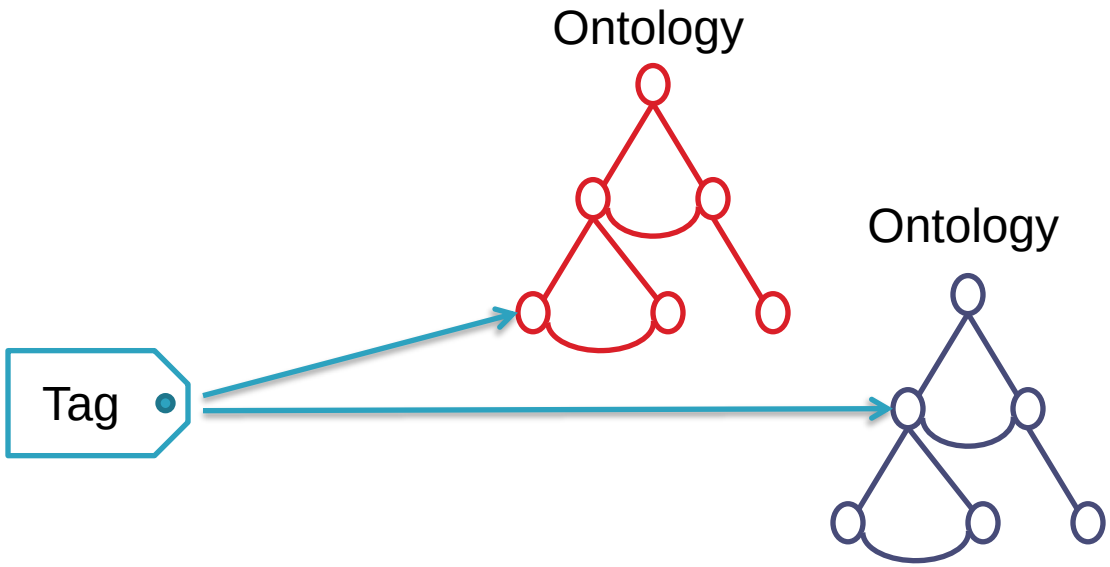
Vocabulary emergence



* www.vanderwal.net

Introduction





Semantics association to tags

Table of Contents

	Technique	Semantic	Automatic
	-**No explicit semantics**		

Our contribution:

- Automatic approach to associate semantics to tags relying on **DBpedia** as semantic resource.
- Disambiguation algorithm inspired by well known information retrieval techniques
- Several context definition as a way to ameliorate tagging data scarceness in the disambiguation process.

- Specia, L., Motta, E., Integrating Folksonomies with the Semantic Web. In *Proceedings of the 4th European Conference on the Semantic Web: Research and Applications*, Innsbruck, Austria (2007)
- Hamasaki, M., Matsuo, Y., Nisimura, T., Takeda, H., Ontology Extraction using Social Network. In International Workshop on Semantic Web for Collaborative Knowledge Acquisition, Hyderabad, India (2007)
- Angeletou, S., Sabou, M., Motta, E., Semantically Enriching Folksonomies with FLOR. In *1st International Workshop on Collective Semantics: Collective Intelligence & the Semantic Web (CISWeb 2008)*, Tenerife, Spain (2008).

Table of Contents

Context & disambiguation

- First disambiguation approach relying on a dictionary (Lesk, 1998)
  - Definitions of the word to disambiguate & of each word in the context.
    - Context: The words appearing in the sentence
  - Definitions of the words in the context are compared against the definitions of the word to disambiguate.

Problems: When the definitions are short. (Sanderson, 2000**)**

- Contexts in folksonomies

- Lesk, M., “They said true things, but called them by wrong names” – vocabulary problems in retrieval systems. in *Proc. 4th Annual Conference of the University of Waterloo Centre for the New OED* (1998)
- Sanderson, M., Retrieving with Good Sense. In *Information Retrieval* 2(1): 47-67 (2000)

Tagora Sense Repository

- Linked data enabled service endpoint
  - Metadata about tags and their possible senses.
    - Wikipedia pages -> Disambiguation or Redirection links
    - Terms and frequencies
    - DBpedia resource related to each Wikipedia page.
  - Query using:
    - REST -> http://tagora.ecs.soton.ac.uk/tag/apple
    - SPARQL end-point.
  - Result: RDF document
- DBpedia coverage:
  - **2.6** million things, 213,000 people, 328,000 places, 57,000 music albums, 36,000 films, 20,000 companies.
    - Wordnet as of 2006 contains about 150,000 words
  - Named entity recognition
  - Classes, Instances, and semantic relations

Tagora

ECS Electronics & Computer Science University of Southampton

Linked data representation of tag senses

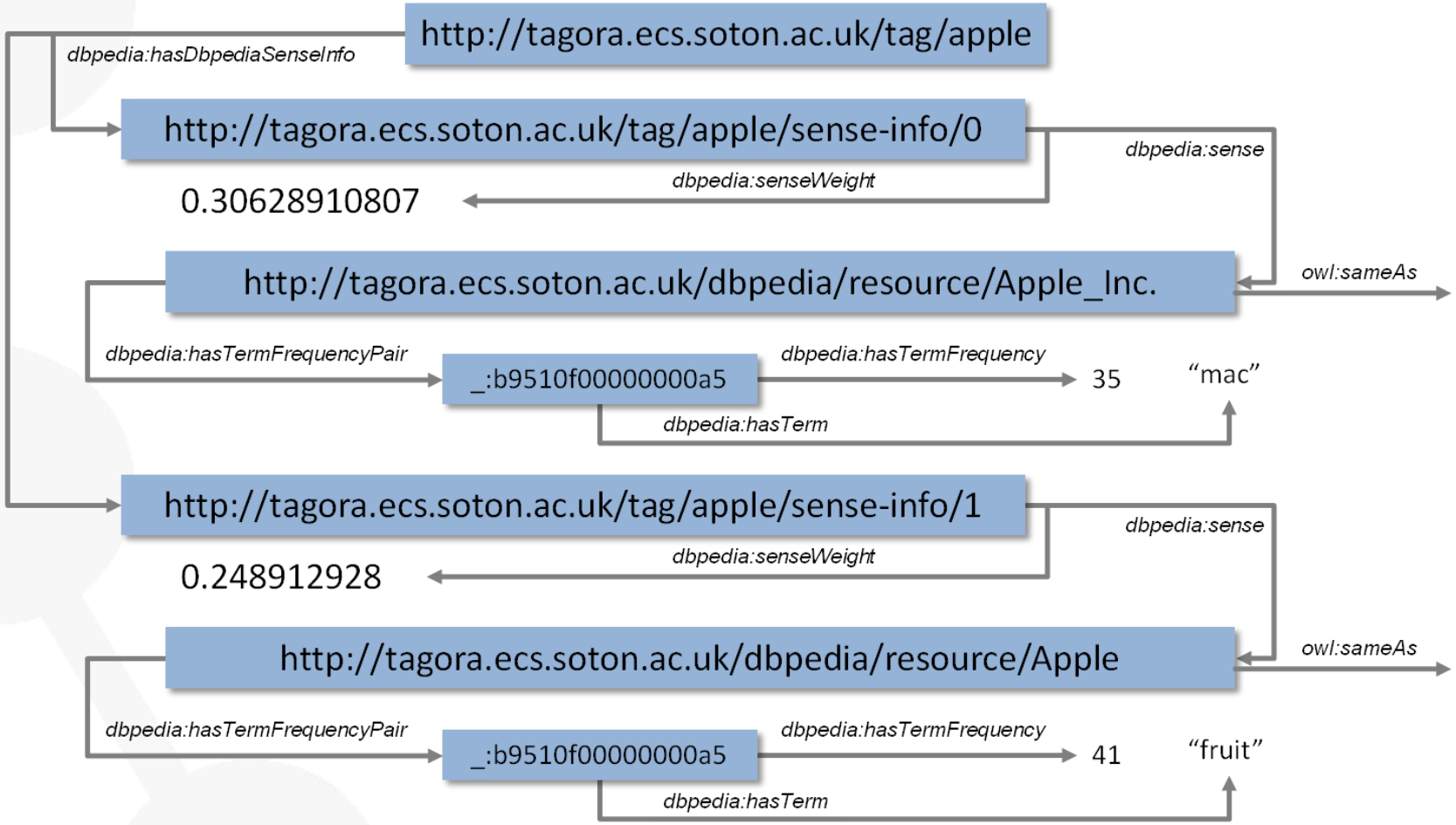


Table of Contents

Disambiguation Approach

- The algorithm selects among a set of candidate DBpedia resources, the one that describe better the meaning of an ambiguous tag according to its context.

- The candidate DBpedia resources and the tag context are represented as vectors using a common vocabulary.
  - The common vocabulary is the union of the most frequent terms in each wikipedia page related to each Dbpedia resource.

- The tag context vector is compared against each DBpedia resource vector using the cosine of the angle as similarity measure.

$$Sim(V_{context}, V_{sense}) = \cos\theta = \frac{V_{context} \cdot V_{sense}}{|V_{context}||V_{sense}|}$$

- The most similar DBpedia entry is selected as the one representing the meaning of the analyzed tag

Disambiguation Approach

- Tagging activity:
  - User *u* has tagged the resource *r* = http://www.nature.com with the tags *nature, news, science.*

- **Context(u, *nature*, r)** = {*nature, news, science*}
- **Senses(*Nature*)** = {*dbpedia:Nature, dbpedia: Nature_(journal)*}
  - Terms(*dbpedia:Nature*) = {(*life,62), (nature,46), (earth,32)*}
  - Terms(*dbpedia:Nature_(journal)*) = {(*nature,77), (science,29), (scientific,25)*}
- **Voc(*nature*)** = { *life, nature, earth, science, scientific* }

- $V_{context}$= (0,1,0,1,0)
- V_{nature}= (62,46,32,0,0)
- $V_{nature(journal)}$= (0,77,0,29,25)

- Sim($V_{context}$, V_{nature}) = 0,389

Sim($V_{context}$, $V_{nature(journal)}$) = **0,872**

Preliminary Results

Some user x has tagged a picture r with the tags *ice*, *iceskating*, *nottingham*, and *skating*.

ice	
dbpedia/resource/Ice	**0,911**
dbpedia/resource/Ice_(comics)	0,735
skating	
dbpedia/resource/Artistic_roller_skating	0,671
dbpedia/resource/Figure_skating	0,569
dbpedia/resource/Freestyle_slalom_skating	0,000
dbpedia/resource/Ice_skating	**0,893**
dbpedia/resource/Road_skating	0,451
dbpedia/resource/Roller_skating	0,394
dbpedia/resource/Skateboarding	0,197
dbpedia/resource/Snowboarding	0,000
dbpedia/resource/Speed_skating	0,549
dbpedia/resource/Tour_skating	0,831
nottingham	
dbpedia/resource/East_Nottingham_Township,_Pennsylvania	0,000
dbpedia/resource/Elizabeth_I_of_England	0,000
dbpedia/resource/Nottingham	**0,750**
dbpedia/resource/Nottingham,_New_Hampshire	0,386
dbpedia/resource/Nottingham_Cooperative	0,524
dbpedia/resource/Nottingham_Township,_Harrison_County,_Ohio	0,000
dbpedia/resource/Nottingham_Township,_Pennsylvania	0,000
dbpedia/resource/Nottinghamshire	0,428
dbpedia/resource/Sheriff_of_Nottingham	0,640
dbpedia/resource/West_Nottingham_Township,_Pennsylvania	0,000

Issues affecting the disambiguation process

DBpedia Entry	Freq (*nottingham*)	Terms in Voc(*nottingham*)
../Nottingham	181	16
../Sheriff_of_Nottingham	9	3
../Nottingham_Cooperative	12	12
../Nottinghamshire	27	15
../Nottingham,_New_Hampshire	14	17

- Dbpedia resources with lower number of terms in *Voc(tag)*
  - *When the context has few terms, it's likely that shorter sense vectors are more similar to the context vector than longer sense vectors.*
- When none of the tags in the context appears in *Voc(tag)* the sense selection is carried out in terms of *freq(tag)*

Table of Contents

Conclusions & Future Work

- Conclusions:
  - Inspired by IR techniques we have presented a tag disambiguation algorithm relying on DBpedia & Wikipedia information.
    - Vector representation of the tag contexts and Dbpedia resources using a common vocabulary based on term frequency.
    - Preliminary results and some identified problems:
      - Few terms in the context
      - Terms in the context do not appear in the common vocabulary
      - Few terms in the Dbpedia resource
  - We have presented different definitions of contexts for tagging activities as a way to ameliorate tagging data scarceness.

- Future Work
  - Improve current results
    - Test the approach in a large tag set with the different contexts.
    - Sophisticated similarity measures
    - Study tagging activities in specific domains.
    - Extract more context information from the tagged resource (text documents)
  - Evaluation of the aproach
    - Evaluation using *Precision* and *Recall*
    - Test bed and Standard evaluation metrics
  - Applications
    - Use DBpedia semantic information to evolve domain ontologies
    - Use DBpedia semantic information to improve searching and recommendation processes.