Near Identity Relationships

No Author Given

No Institute Given

0.1 Near identity relationship

In order to evaluate if entity matching contexts can help to identify pairs of entities engaged in a near identity relationship, we imagined the following scenario: In a first step a corpus of pairs of entities engaged in a near identity relationship is prepared by an expert. The near identity relationships represented by this corpus relate to a concept present in the world. It can be, for example the work of a writer or a film director. In a second step we compute all entity matching contexts for the pairs of the corpus. Given that there is an order of relation between contexts, we would like to know if keeping only the most representative properties of each context ε, Δ and Ω constitutes a reliable representation of the near identity relationship represented by this corpus.

In other words, the aim of this use case is to determine whether there are one or few representatives derived entity matching context *patterns* that summarise the near-identity relationships. If so, it means that near identity relationships are detectable by the entity matching process through the entity matching contexts and patterns. Otherwise it means that despite the corpus provided we are not able to summarise the near identity relationship to few patterns.

In order to make this determination we need to: (i) build a corpus that represents near-identity relationships, (ii) design a procedure that derive pattern(s) from a collection of entity matching contexts, (iii) compute EMCs from the corpus build in (i) and discover pattern(s) with the procedure designed in (ii). Finally (iv) we have to evaluate if pattern(s) is (are) representative of the corpus we have built up. To do this we simply compute the support of pattern(s) on the collection of EMCs computed in (iii).

The subsection is organised as follows. We first describe the building of 5 corpora. We then briefly explain the pattern derivation procedure. This procedure have been applied on the 5 corpora and we present patterns obtained. We have finally evaluated the representativeness of these patterns.

Corpora construction We have built 5 corpora representing 2 different categories of near entity relationship. (i) relations that describe a more general concept than the one encoded in knowledge graphs (the concept of a literary or cinematographic work versus the concept of a book or film) and (ii) relationships that describe much more tenuous links between entities, entities linked together by their country. What motivated the construction of the second category was the construction of entity spaces as described by [Van Erp et *al.* Toward Entity

Spaces] , where the label Germany appears in three different contexts: the context of the meat industry, the context of the German population and the context of the German Davis Cup team. The table 1 presents for each corpus the type of entities used to build the pair, the property used to link these entities, and the number of author, director or countries present in each corpus.

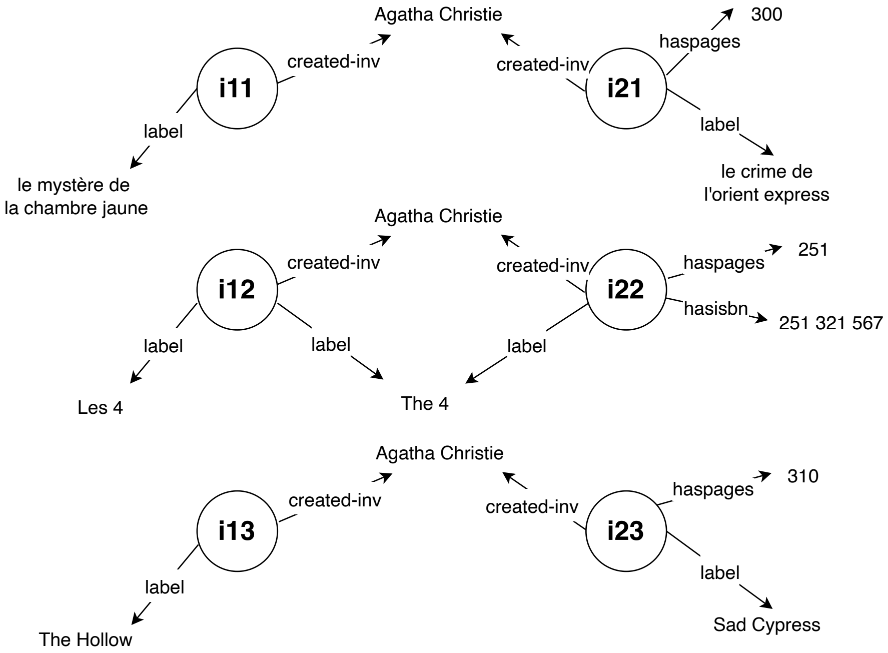
Corpus name	Entity 1 type	Entity 2 type	Link done on property	Nb
Literary Work: books written by the same author	DBpedia Book	YAGO Book	author (created-inv)	4928 authors
Film Work: films made by the same director	DBpedia Film	YAGO Film	director (created-inv)	8500 film directors
Book University: books and universities located in the same country	DBpedia Book	DBpedia University	islocatedin	126 countries
Book Mountain: books and mountains located in the same country	DBpedia Book	DBpedia Mountain	islocatedin	143 countries
Mountain University: mountains and universities located in the same country	DBpedia Mountain	DBedia University	islocatedin	598 countries

Table 1. Description of the 5 corpora.

Pattern Detection Procedure To explicit patterns detection we present here a toy example. The table 2 presents 3 EMCs computed from pairs of books of Agatha Christie. The pairs share the same author in each case, but titles (label) differs and the number of pages or the isbn number are missing. The last line of the table represents the pattern derived from these 3 relationships. Notice that in this toy example, all the EMCs matches with the pattern detected, we obtain a coverage of 100%.

Pattern Discovery and Evaluation In the same idea we performed pattern discovery (i) on the Literary Work and Film Work corpora and (ii) on the 3 corpora of books, mountains and universities from the same country. The first row of

Table 3 shows that 90% of the pairs from the literary works corpus are recognised by a single pattern $P1 = \{created{-}inv\}, \{skos : preflabel\}, \{wascreatedonyear\}$. The second line shows that 2 patterns ($P2$ and $P3$) need to be combined for 90% of the pairs in the cinematographic corpus to be recognised. The second part of Table 3 shows that 96% of pairs from the book-mountain and book-university corpora are recognised by the same parttern. But it takes a combination of 4 patterns to recognise 98% pairs of the mountain-university corpus. It appears that, on the 5 corpora studied, it is possible to summarise near-identity relationships with few patterns.



i11,i21	{created-inv}	{label}	{haspages}
i12,i22	{created-inv,label}	{label}	{haspages,hasisbn}
i13,i23	{created-inv}	{label}	{has-pages}
pattern	{created-inv}	{label}	{has-pages}

Table 2. The example of pattern construction based on 3 EMCs.

0.2 Code

Corpora construction, pattern detection and representativeness evaluation are available in the following scripts:

- iswc2024/pattern/author_work_pattern.py for the corpus author work

corpus	pattern $\varepsilon\Delta\Omega$	nb match	total nb EMCs	coverage
literary work	P1={created-inv},{skos:preflabel},{wascreatedonyear}			
	P1	148281	165508	0.90

film work	P2={directed-inv}{skos:preflabel},{wascreatedonyear}
	P3={directed-inv}{skos:preflabel},{islocatedin}			

	P2 ∪ P3	606529	674952	0.90
book mountain	P4={islocatedin},{skos:preflabel}, {created-inv}			
	P4	15320925	15993180	0.96
book university	P5={islocatedin},{skos:preflabel},{created-inv}			
	P5	15320840	15993082	0.96

mountain university	P6={islocatedin},{islocatedin},{haslatitude}, {haslongitude}
	P7={islocatedin},{islocatedin},{graduatedfrom-inv}
	P8={islocatedin}{islocatedin},{}
	P9={islocatedin}{islocatedin},{hasmotto}			

	P6 ∪ P7 ∪ P8 ∪ P9	4708646	4795678	0.98

Table 3. Patterns detection on corpora.The coverage is computed as follows: $\frac{nb\_EMCs\_that\_matches\_pattern}{nb\_total\_EMCs}$

- iswc2024/pattern/director_work_pattern.py for the corpus cinematographic work
- iswc2024/pattern/country_work_pattern.py for the 3 corpora of entities linked by their countries