Knowledge Graph Refinement: A Survey of Approaches and Evaluation Methods

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Outline

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1. Generell Information

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Focus: The paper surveys methods and evaluation approaches for refining knowledge graphs, with emphasis on enhancing their completeness and correctness

2. Research Goal

2.1 Problem

- Not about creation
- Knowledge Graphs (KG) cannot be 100% complete or correct
- Tradeoff between correctness and completness

2.2 Solution

Methods for enhancing the quality and completness of these existing KG's

3. Evaluation

To assess correctness/completeness, we need evaluations. The three most common ways to evaluate a KG are:

3.1 (Partial) Gold Standard

- Human labels or using other KGs.

3.2 Silver Standard

- Using the KG itself (assumes correctness -> can only be used for completeness).

3.3 Retrospective Evaluation

4. Methods Used

Only approaches for entity/relation completion/correctness are scrutinized.

4.1 Types of Methods

The Methods can be categorized under the following dimensions:

- Completeness/Correctness
- Internal/External

4.2.1 Internal

- Association Rule Mining (Types and Relations): Derives rules based on frequent co-occurrences in the KG. e.g. ingoing edges of type **Cast** $\rightarrow$ probability that the predicate is of type **Actor** is large
- Logical Reasoning: Infer rules directly

4.2.2 External

- Web search by generating search quieres, e.g. ‘Relationship between Actor and Film’
- Using Abstracts of Wikipedia with NLP
- Using other KG’s, identify patterns

4.3.1 Internal

- Outlier Detection: taking the characteristics of the object and subject of the relationship and create distirubtion from it for each relation
- Reasoning by looking at Classes (needs disjoint axioms)
- Classic Outlier Detection for numerical values
- Limitation: A lot of outliers are errors, but not all errors are outlier

4.3.2 External

- Web search: creating sentnces out of triples -> count hits -> generate probability
- Let Humans correct some samples -> hope to find root cause of erros
- Linking different KG's -> Identify facts differing in one KG but aligning in others

5. Findings

- Many algorithms only focus on identifying erros, not fixing them
- Probalbistic methods such as “Association Rule Mining” could be used for Error detection and completion simultaneously
- Algorithm efficency relvant for large KG’s
- Most methods are only tested on one KG which limits the statistical significance of the results
- No benchmark method for completness or correctness

Sources

1. https://www.semantic-web-journal.net/system/files/swj1167.pdf

Thank you for attending my presentation!