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informatik

Enriching KBs with *interesting negative statements*

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Awards of Stephen Hawking

Wikidata

Albert Einstein Medal

Wolf Prize in Physics

Copley Medal

Presidential Medal of Freedom

Naylor Prize and Lectureship

Eddington Medal

Michelson-Morley Award

Fellow of the Royal Society

Order of the British Empire

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42 awards in total.



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One salient award that he has NOT won ...

The Nobel Prize in Physics!

Problem: positive-only KBs

Problem: Existing positive-only KBs are unaware of salient negation.



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Our proposal.

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Our proposal:

peer-based statistical inference + local CWA + learning to rank.



Peer-based statistical inference

Given a knowledge base KB, and an entity e:

- **Gist:** we select *highly related entities (peers)* to e, that set expectations about e, where the negation of these expectations are potentially **salient**.
- **Implicit assumption:** within a group of *peers*, we are assuming **local CWA**.

If KB does NOT list..

Nobel in Physics as an award won by Hawking

BUT.. list it for his peers..

it is assumed to be false for Hawking

(and not merely a missing statement)

Peer-based statistical inference -steps

1 Input: KB, and e
KB = Wikidata, e = Stephen Hawking

Selecting highly related entities:
entity embeddings, structured
facets, graph-base measures...

Measure for people ->
Occupations(Hawking) = physicist.

Collecting peers of e

2

statement	Einstein	Feynman	Hawking	Relative Freq.
citizen; U.S.A	1	1	0	1
employer; University of Zurich	1	0	0	0.5
award; Nobel in Physics	1	1	0	1
native language; English	0	4	4	-

Inferring negative candidates

Top-k interesting negations about e

1. \neg (award; Nobel in Physics)
2. \neg (citizen; U.S.A.)
3. \neg (employer; University of Zurich)

**Further scoring using a set
of features:
Property frequency, pivoting,..**

Learning to rank

3



Experiments

1. **Intrinsic: Ability to rank negations by interestingness;**
Stephen Hawking: \neg (*award; Nobel in Physics*), \neg (*citizen; U.S.*),
 \neg (*citizen; Egypt*) \neg (*actedIn; Titanic*).
2. **Extrinsic 1: General entity summarization of only positive statements vs a mix of positive and negative statements.**
3. **Extrinsic 2: Decision making on hotel booking using pos features vs a mix.**
4. **Extrinsic 3: Question answering.**

Entity summarization

Setup.

Mixed Wikidata entities.

Task.

Which set contain more interesting information about Hawking?

A	B
(native language; English)	↪ (award; Nobel Prize in Physics)
(child; Lucy Hawking)	(child; Lucy Hawking)
(award; Wolf Prize in Physics)	(award; Wolf Prize in Physics)
(occupation; astronomer)	(occupation; astronomer)
(employer; Gonville and Caius College)	↪ (citizen; U.S.A.)

Results.

72% (mix pos & neg);

16% (pos only);

12% (either or neither).

Hotel booking

Setup.

Booking.com hotel listings.

Task.

Which set of features is more helpful for you to make a decision about staying in this hotel?

A	B
(free-Wifi)	(free-Wifi)
(fitness center)	¬ (facilities for disabled people)
(business facilities)	(business facilities)
(concierge)	¬ (pets)
(minibar)	(minibar)

Results.

63% (mix pos % neg);

21% (pos only);

16% (either or neither).

Conclusion

- Negations are useful for entity summarization, decision making, and question answering.
- We propose a method for automatically discovering salient negations about entities in KBs: peer-based statistical inference.
- *More in the paper..*
 - More experiments on interestingness and correctness of our inferred negative statements.
 - A **second methodology** on automatically extracting salient negations from text – Query-logs.
 - First **datasets** on interesting negations from Wikidata – publicly available. [tinyurl.com/yb5dtfqt]



Thank you!

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