UNIVERSITY OF AMSTERDAM

YAHOO!

Explaining relationships between entities

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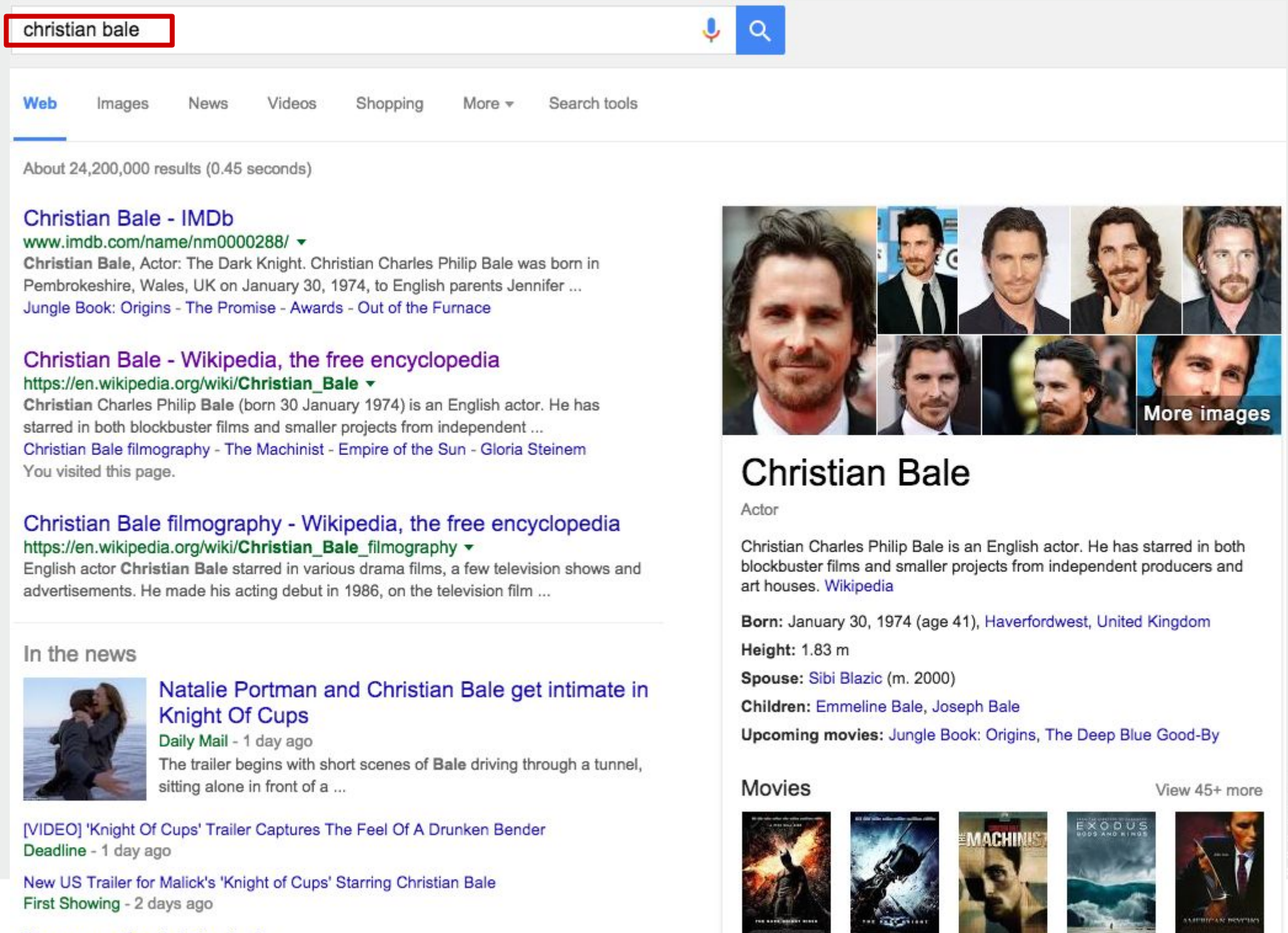
Motivation

Knowledge graphs

- Contain entities and relationships
- Support multiple search tasks
  - Web search
  - Exploratory search
  - Recommendation
  - Question answering
  - ....

Motivation


christian bale
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Christian Bale - IMDb
www.imdb.com/name/nm0000288/
Christian Bale, Actor: The Dark Knight. Christian Charles Philip Bale was born in Pembrokeshire, Wales, UK on January 30, 1974, to English parents Jennifer ...
Jungle Book: Origins - The Promise - Awards - Out of the Furnace
Christian Bale - Wikipedia, the free encyclopedia
https://en.wikipedia.org/wiki/Christian_Bale
Christian Charles Philip Bale (born 30 January 1974) is an English actor. He has starred in both blockbuster films and smaller projects from independent ...
Christian Bale filmography - The Machinist - Empire of the Sun - Gloria Steinem
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https://en.wikipedia.org/wiki/Christian_Bale_filmography
English actor Christian Bale starred in various drama films, a few television shows and advertisements. He made his acting debut in 1986, on the television film ...
In the news
Natalie Portman and Christian Bale get intimate in Knight Of Cups
Daily Mail - 1 day ago
The trailer begins with short scenes of Bale driving through a tunnel, sitting alone in front of a ...
[VIDEO] 'Knight Of Cups' Trailer Captures The Feel Of A Drunken Bender
Deadline - 1 day ago
New US Trailer for Malick's 'Knight of Cups' Starring Christian Bale
First Showing - 2 days ago
More images
Christian Bale
Actor
Christian Charles Philip Bale is an English actor. He has starred in both blockbuster films and smaller projects from independent producers and art houses. Wikipedia
Born: January 30, 1974 (age 41), Haverfordwest, United Kingdom
Height: 1.83 m
Spouse: Sibi Blazic (m. 2000)
Children: Emmeline Bale, Joseph Bale
Upcoming movies: Jungle Book: Origins, The Deep Blue Good-By
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Motivation

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Christian Charles Philip Bale is an English actor. He has starred in both blockbuster films and smaller projects from independent producers and art houses. Wikipedia

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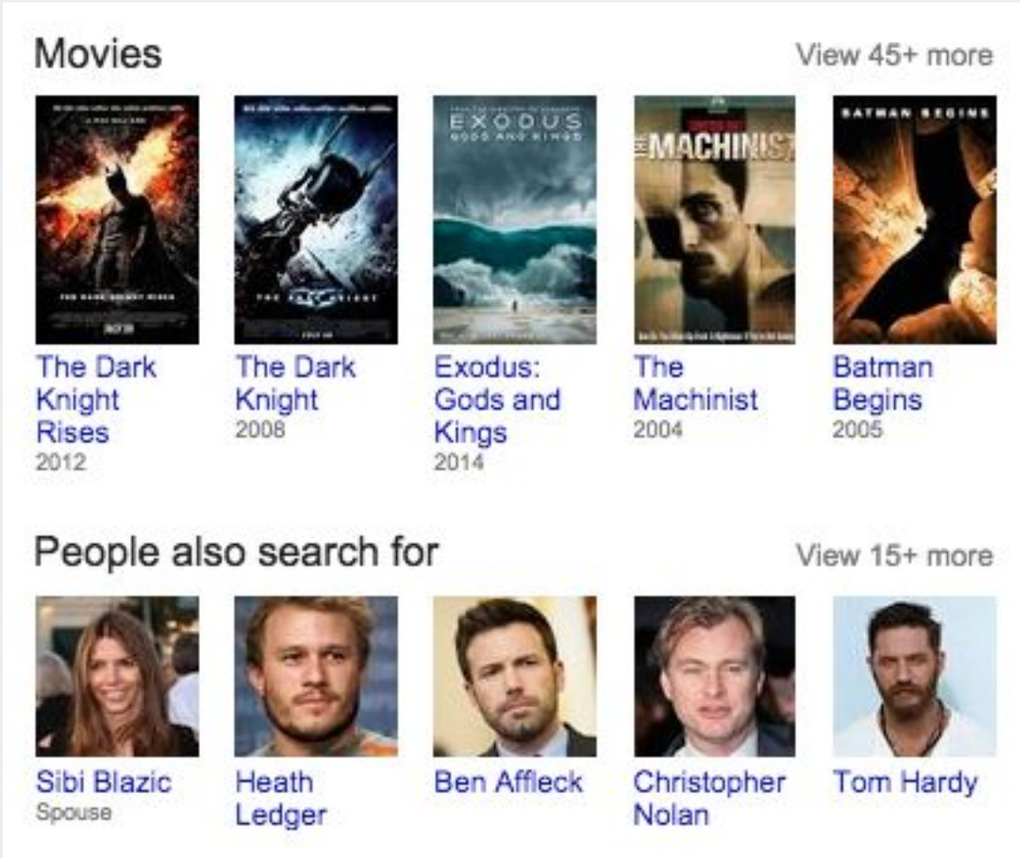
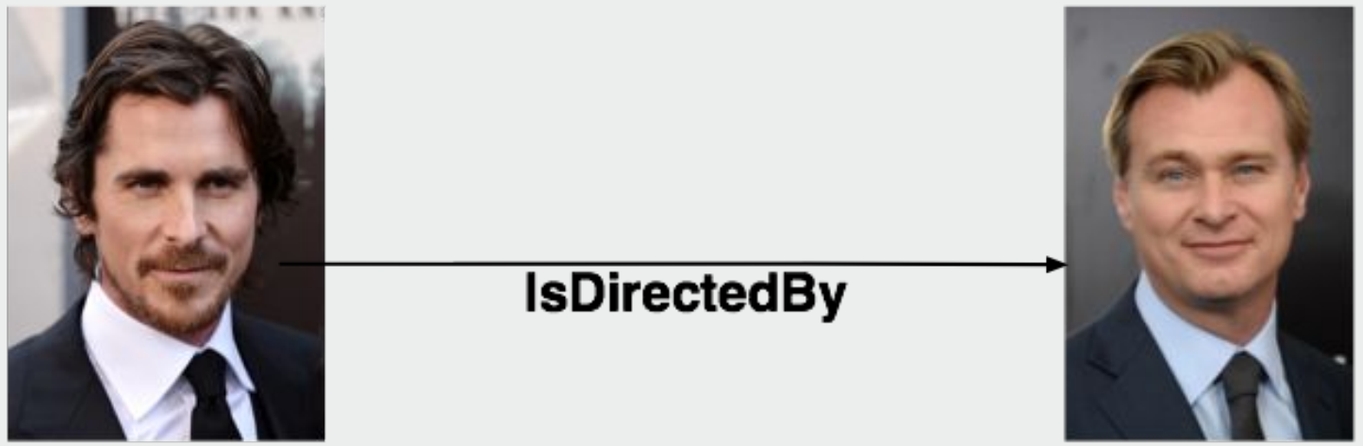
Children: Emmeline Bale, Joseph Bale

Parents: David Bale, Jenny James



Explaining relationships between entities

Motivation



Problem: Knowledge Graphs represent entity relationships using formal descriptions which are not suitable for presenting to the end user

Task: Explain / provide evidence for the relationships using human-readable descriptions

Motivation: example

- ***Christian Bale*** *won the coveted role of Batman and his alter ego Bruce Wayne in* ***Christopher Nolan****'s Batman Begins, a reboot of the Batman film series.*

- ***Bale*** *went on to receive greater commercial recognition and acclaim for his performance as* Bruce Wayne/Batman in ***Nolan's*** *Batman Begins.*

Method

Approach the problem as a sentence retrieval task.

Given an entity pair and a relationship,

1. **Extract and enrich** candidate sentences
2. **Rank** the candidate sentences by how well they describe the relationship of interest

Method: 1

Extract and enrich candidate sentences

a. Apply coreference resolution and entity linking

"**He** is set to star opposite **Jolie** in her third directorial effort, ***By the Sea***…"

Brad Pitt ***Angelina Jolie*** ***By the Sea (2015 film)***

b. Extract candidate sentences for the entity pair using the surface forms and the links of the entities

Method: 2

Rank the candidate sentences using learning to rank

- Each entity pair is associated with a set of sentences
- Each sentence is represented by a set of features
- Train a model that can predict the relevance of a sentence given an entity pair and a relationship

Method: 2

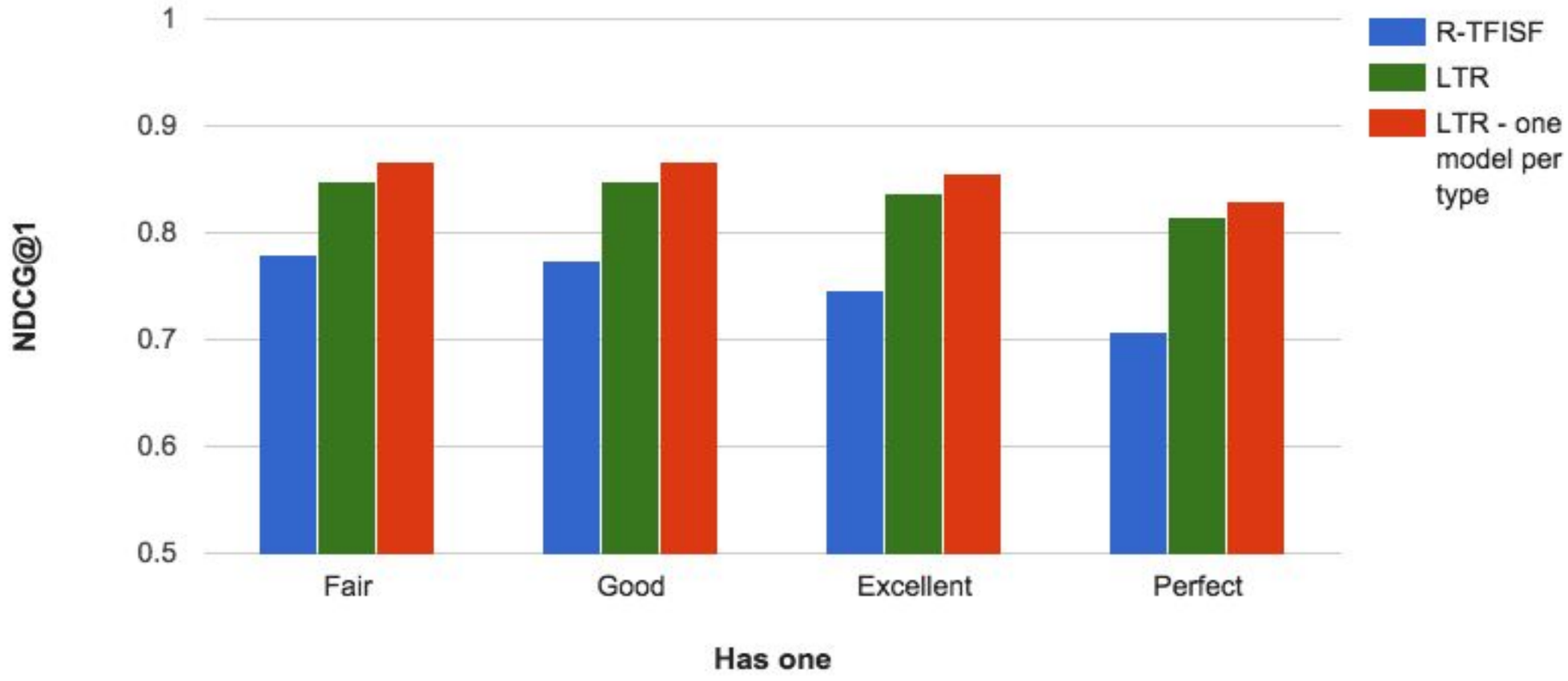
Rank the candidate sentences using learning to rank

- Text features
  - Length, POS fractions, lexical density, ...
- Entity features
  - Presence / spread of the entities, common links (e.g. “Mr. & Mrs. Smith”), ...
- Relationship features
  - Term matching (“spouse”), WordNet (“husband”), word2vec (“is married to”)
- Source features
  - Number of occurrences of the entities in the document, ...

Experimental setup

- Focus on “people” entities appearing in Wikipedia
- Entity relationships drawn from Yahoo’s knowledge graph
- Wikipedia as a sentence corpus
- 5-level graded relevance, 5-fold cross validation
- Sentence retrieval models as baselines
  - LM, BM25, Lucene, TFISF, R-TFISF
  - query = {entity pair, expanded relationship terms}

Main findings



- Significant improvements over state-of-the-art sentence retrieval methods
- Relationship-dependent models significantly improve performance
- Relationship and entity features the most important

Conclusion

- Proposed a method for entity relationship explanation in KGs
- Significant improvements over state-of-the-art sentence retrieval baselines
- Next steps
  - Evaluate on more entities and relationships (+open domain)
  - Increase coverage
    - explore other corpora
  - Handle multiple relationships per entity pair
    - e.g. sentence fusion

Remarks

- ACL 2015 paper

  Learning to Explain Entity Relationships in Knowledge Graphs,

  with E. Meij, M. Tsagkias, M. de Rijke and W. Weerkamp

- Dataset available on GitHub!
  - http://bit.ly/1OLnxA4

Thanks!

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