

Knowledge Graphs

Lecture 6 - Advanced Knowledge Graph Applications

6.5 Semantic Search

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Leibniz-Institut für Informationsinfrastruktur

Knowledge Graphs

Lecture 6: Advanced Knowledge Graph Applications

6.1 The Graph in Knowledge Graphs

6.2 Knowledge Graph Embeddings

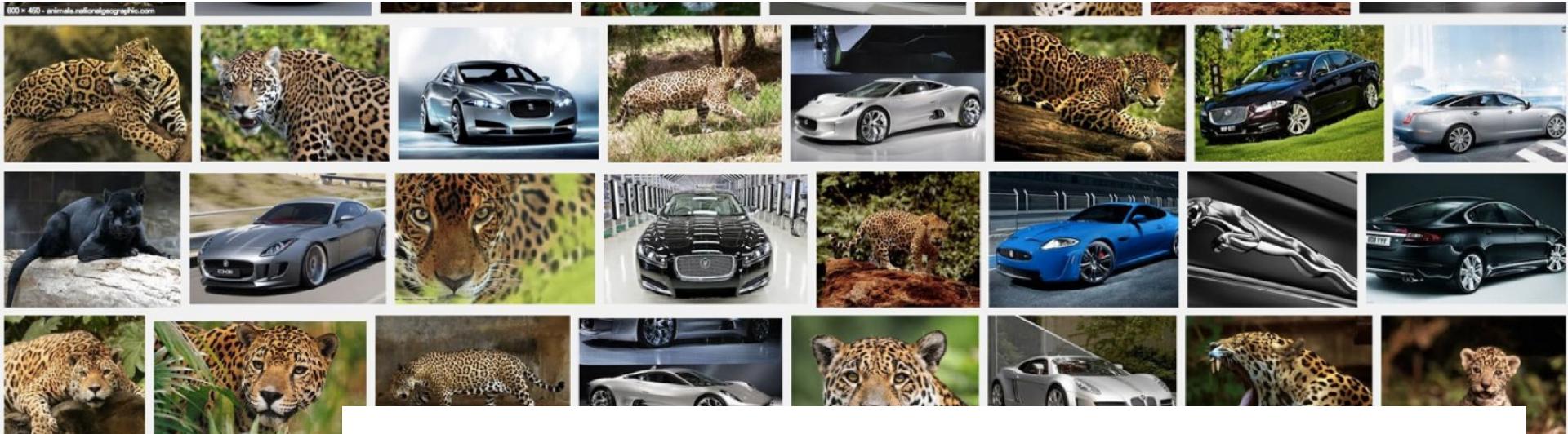
6.3 Knowledge Graph Completion

6.4 Knowledge Graph Mappings and Alignment

6.5 Semantic Search

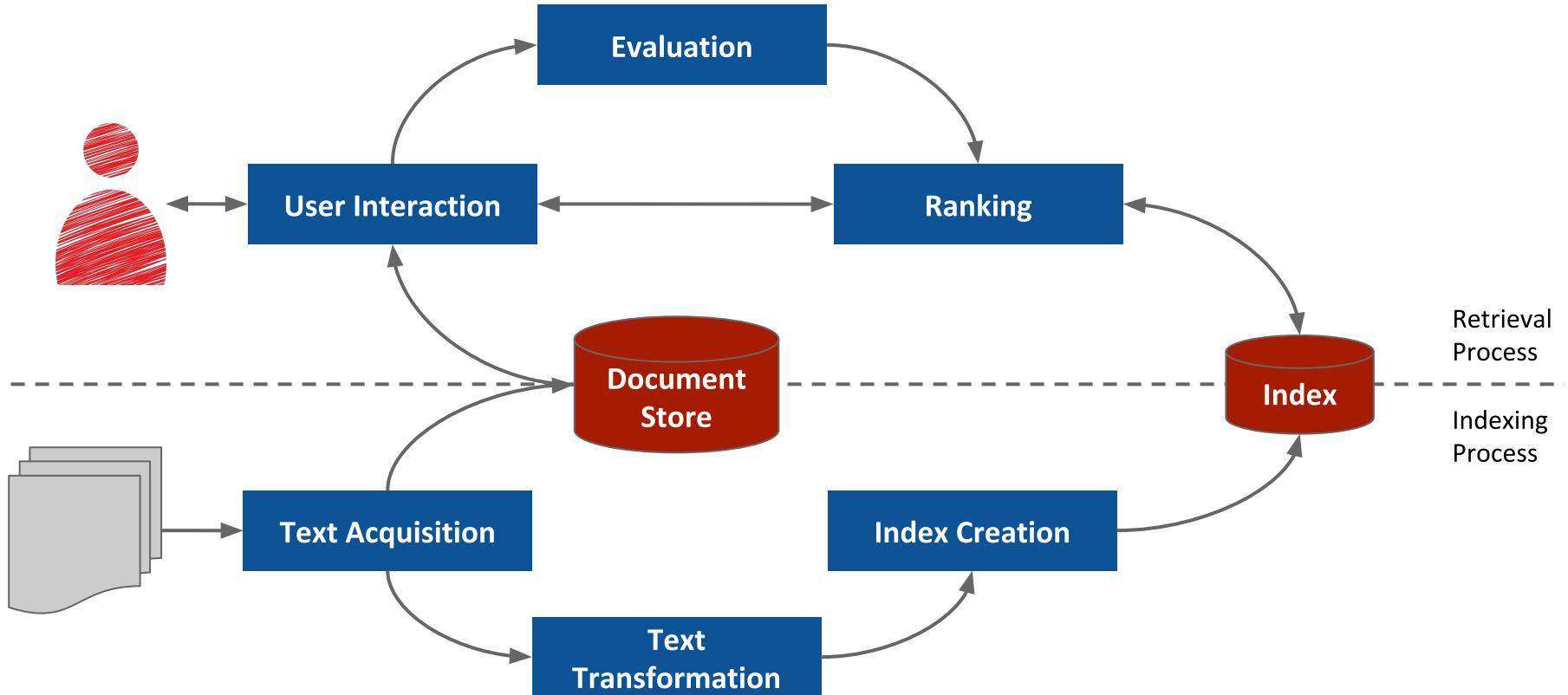
6.6 Exploratory Search and Recommender Systems

The Information Retrieval Dilemma

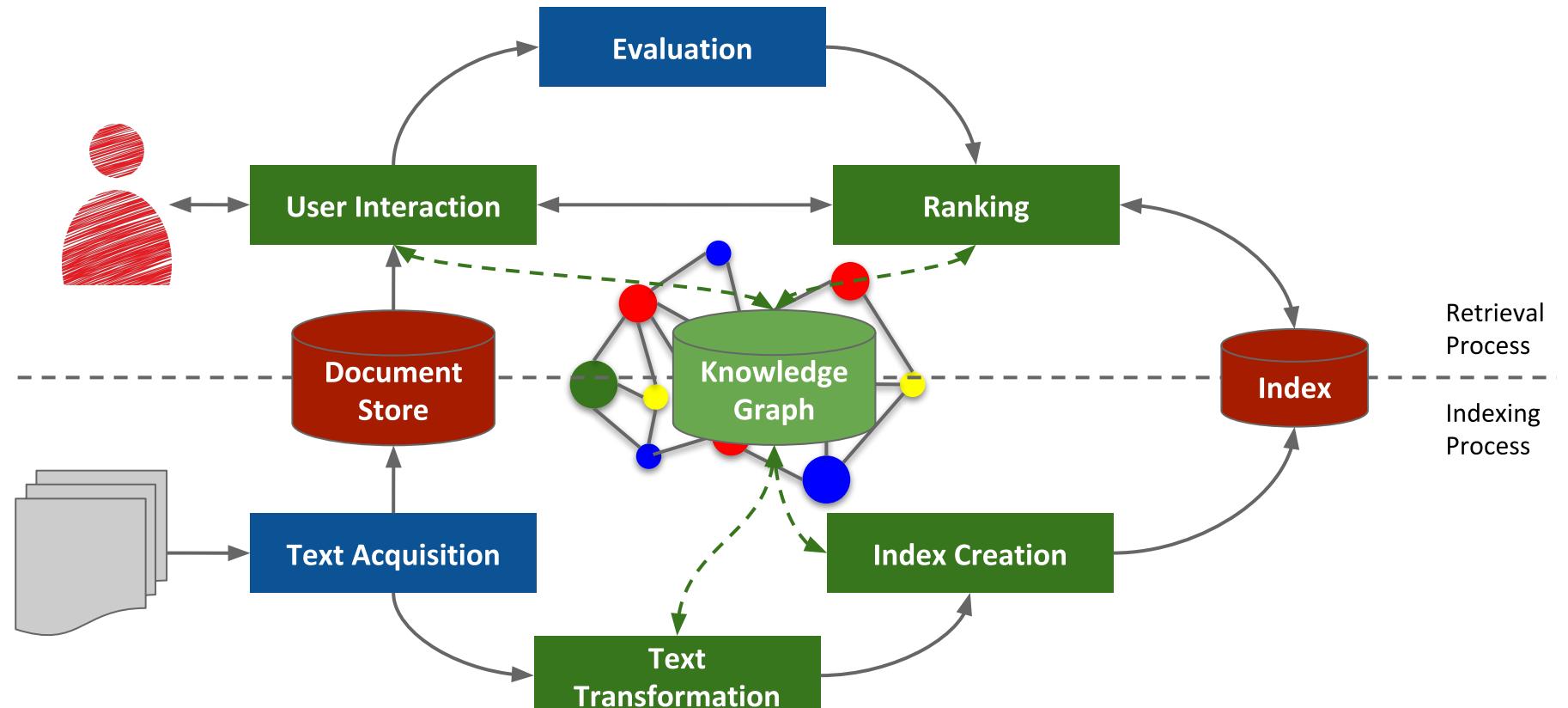


- Ambiguity of natural language (polysemy)
- Different words/expressions for the same concept (synonyms, metaphors, paraphrases,...)

The Information Retrieval Process



Knowledge Graph Supported Retrieval Process



Knowledge Graph Supported Retrieval Process

- Prerequisite:

Document Annotation with explicit semantics, e.g. semantic entities

On August 5, 1930, American astronaut Neil Alden Armstrong was born, the first person to walk on the Moon. He was also an professor. Armstrong was missioned to the Moon as part of the Apollo 11 mission. Armstrong's Youth and Education

Neil Armstrong was born in Wapakoneta, Ohio, on August 5, 1930. He was an auditor for the Ohio state auditorium. Armstrong experienced his first flight in a Trimotor. Armstrong attended Wapakoneta airfield. In 1947, he graduated from Wapakoneta High School and began attending Purdue University, funded by the Navy. He followed by three years of service in the Navy, followed by two years of study at the University of Cincinnati, and then two years of study at the University of Illinois Urbana-Champaign.

birth year	1930
death year	2012
death place	Cincinnati
type	NASA
occupation	Naval aviation
death place	Ohio

Example for
Linked Data
Based Document
Annotation

<http://scihi.org/neil-armstrong/>

- Enables **entity-based Information Retrieval**
 - Language independent

Entity Based Search

Query Processing:

Armstrong on the Moon

Named Entity Linking

dbr:Neil Armstrong dbr:Moon

Indexing:

The first Man on the Moon

....
On the Moon, the 38-year-old civilian commander, radioes to earth and the mission control room here: "Houston, Tranquility Base here, The Eagle has landed."
....

dbr:Neil Armstrong

dbr:Moon

Named Entity Linking

Entity-Based Query Matching

- simple entity matching
 - similarity-based entity matching
 - relationship-based entity matching
 - ...

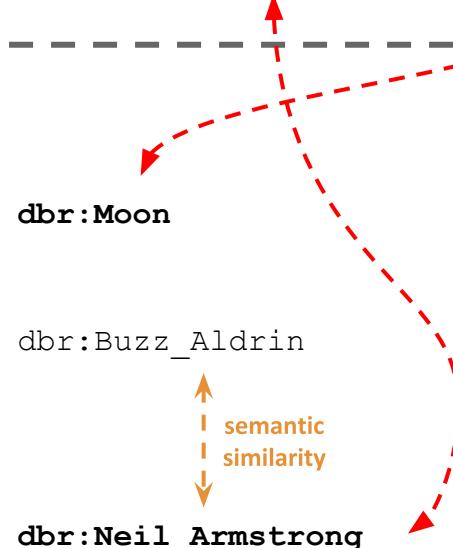
Entity Based Search

Query Processing:



Named Entity Linking

Indexing



Entity-Based Query Matching

- simple entity matching
- **similarity-based entity matching**
- relationship-based entity matching
- ...

Two entities are considered **semantically similar**

- if they share property/value pairs
- if they share properties with similar values

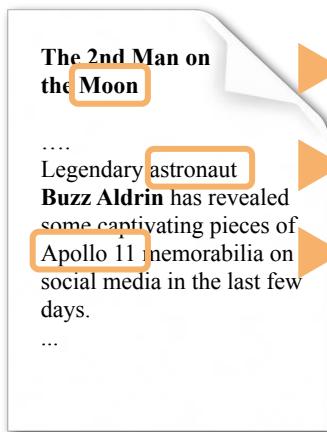
Named Entity Linking

Entity Based Search

Query Processing:

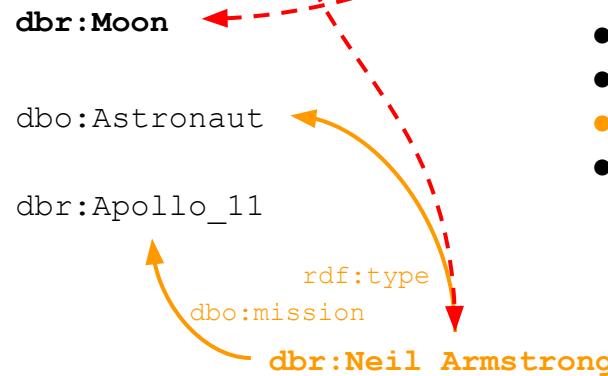


Indexing



Entity-Based Query Matching

- simple entity matching
- similarity-based entity matching
- **relationship-based entity matching**
- ...



Named Entity Linking

Retrieval vs. Exploration



Exploratory Search and Recommender Systems

Next Lecture...

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6.5 Semantic Search

Picture References:

- [1] Carl Spitzweg, The Bopokworm, 1850, [Public Domain] https://commons.wikimedia.org/wiki/File:Carl_Spitzweg_021.jpg
- [2] Hartman Schedel, Nuremberg Chronicle, 1493, https://commons.wikimedia.org/wiki/File:Nuremberg_chronicles - f_13b.png