

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

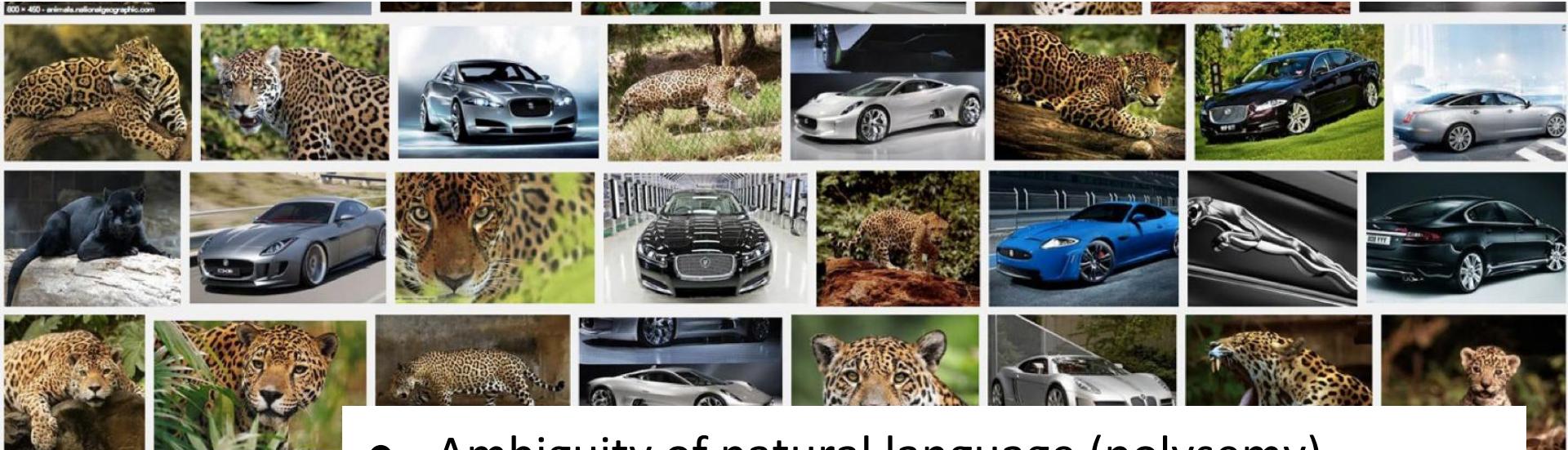
6.3 Knowledge Graph Completion

6.4 Knowledge Graph Mappings and Alignment

6.5 Semantic Search

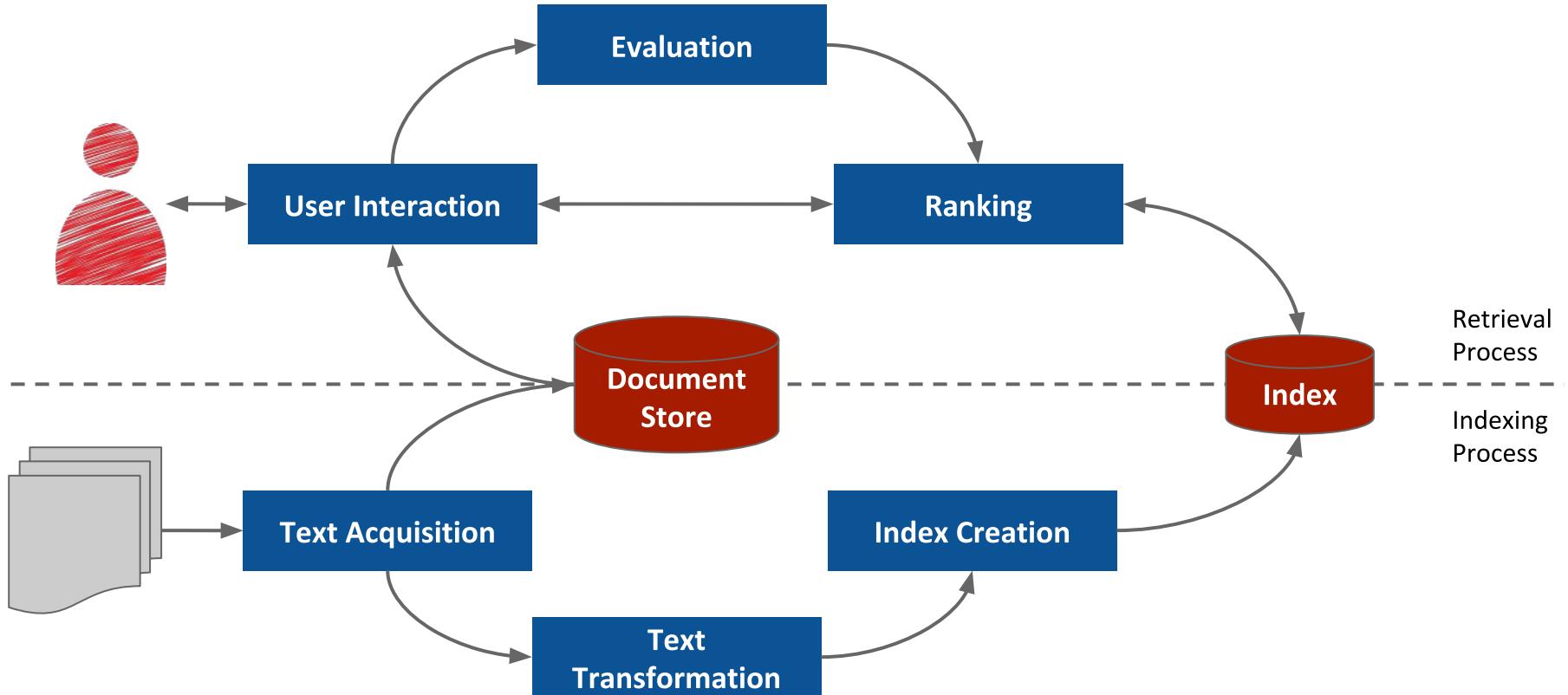
6.6 Exploratory Search and Recommender Systems

The Information Retrieval Dilemma

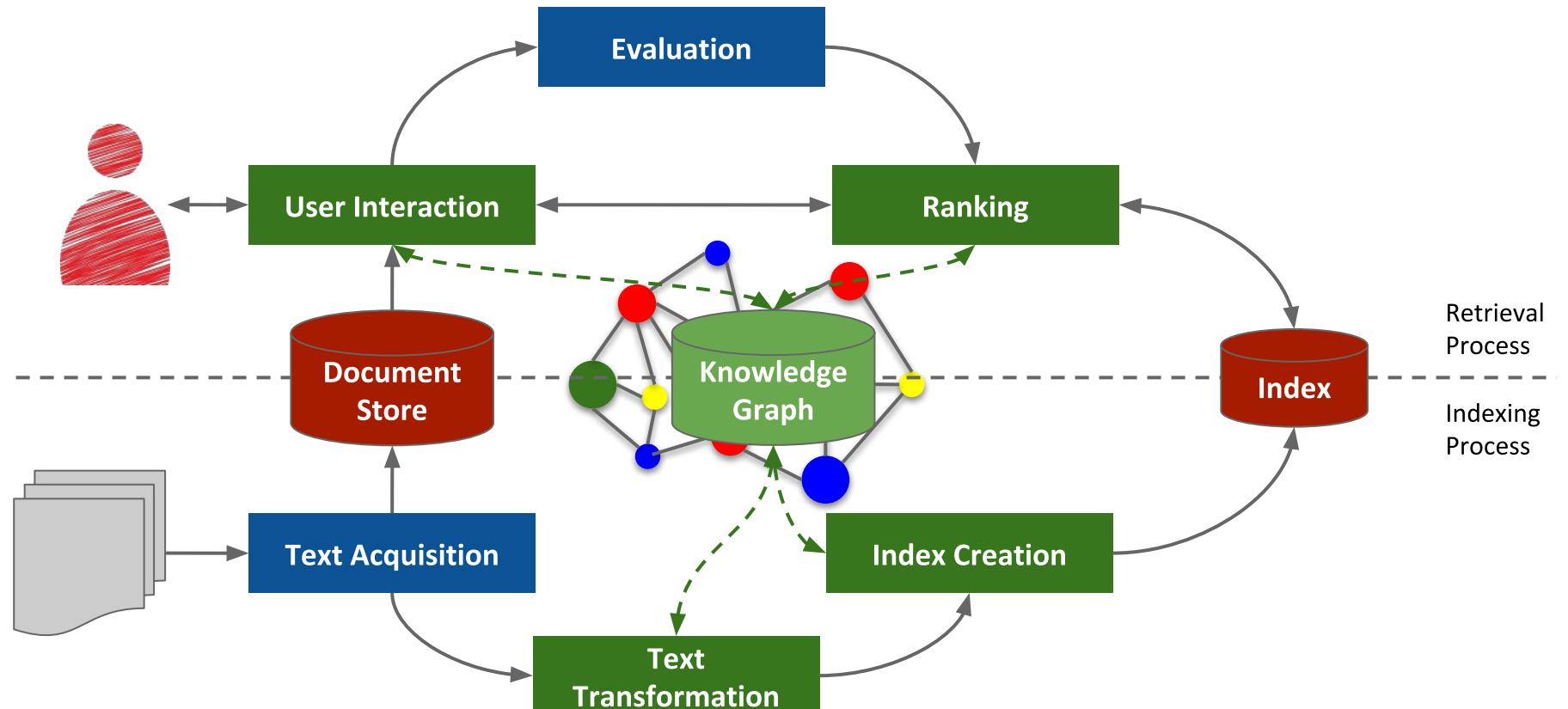


- Ambiguity of natural language (polysemy)
- Different words/expressions for the same concept (synonyms, metaphors, paraphrases,...)

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 missio

Neil Armstrong
Neil Alden Armstrong (August 5, 1930 – August 25, 2012) was an American astronaut and the first person to walk on the Moon. He

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

Stephen Koenig Armstrong, Already at the age of five, her took a ride in a Ford

ng lessons at the grassy aeronautical engineering at d to two years of study, n of the final two years of

the degree. Armstrong's call-up from the Navy arrived in 1949, requiring him to report to Naval Air Station Pensacola for flight training to qualify as Naval Aviator in 1950. Armstrong served in

Example for
Linked Data
Based Document
Annotation

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

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

Entity Based Search

Query Processing:

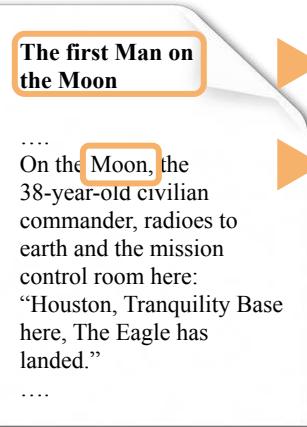
Armstrong on the Moon

Named Entity Linking

dbr:Neil Armstrong

dbr:Moon

Indexing:



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:



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

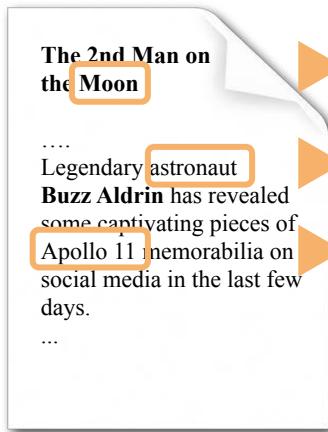
Named Entity Linking

Entity Based Search

Query Processing:

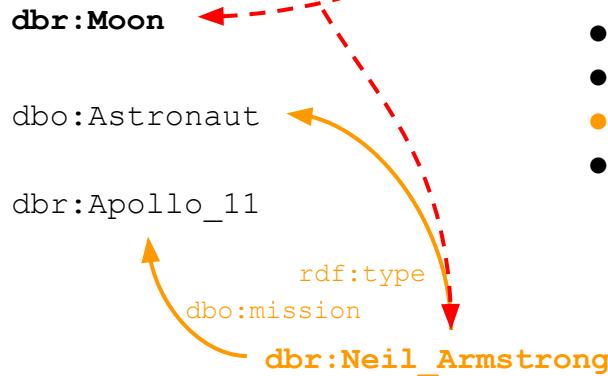


Indexing



Entity-Based Query Matching

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



Named Entity Linking

Retrieval vs. Exploration

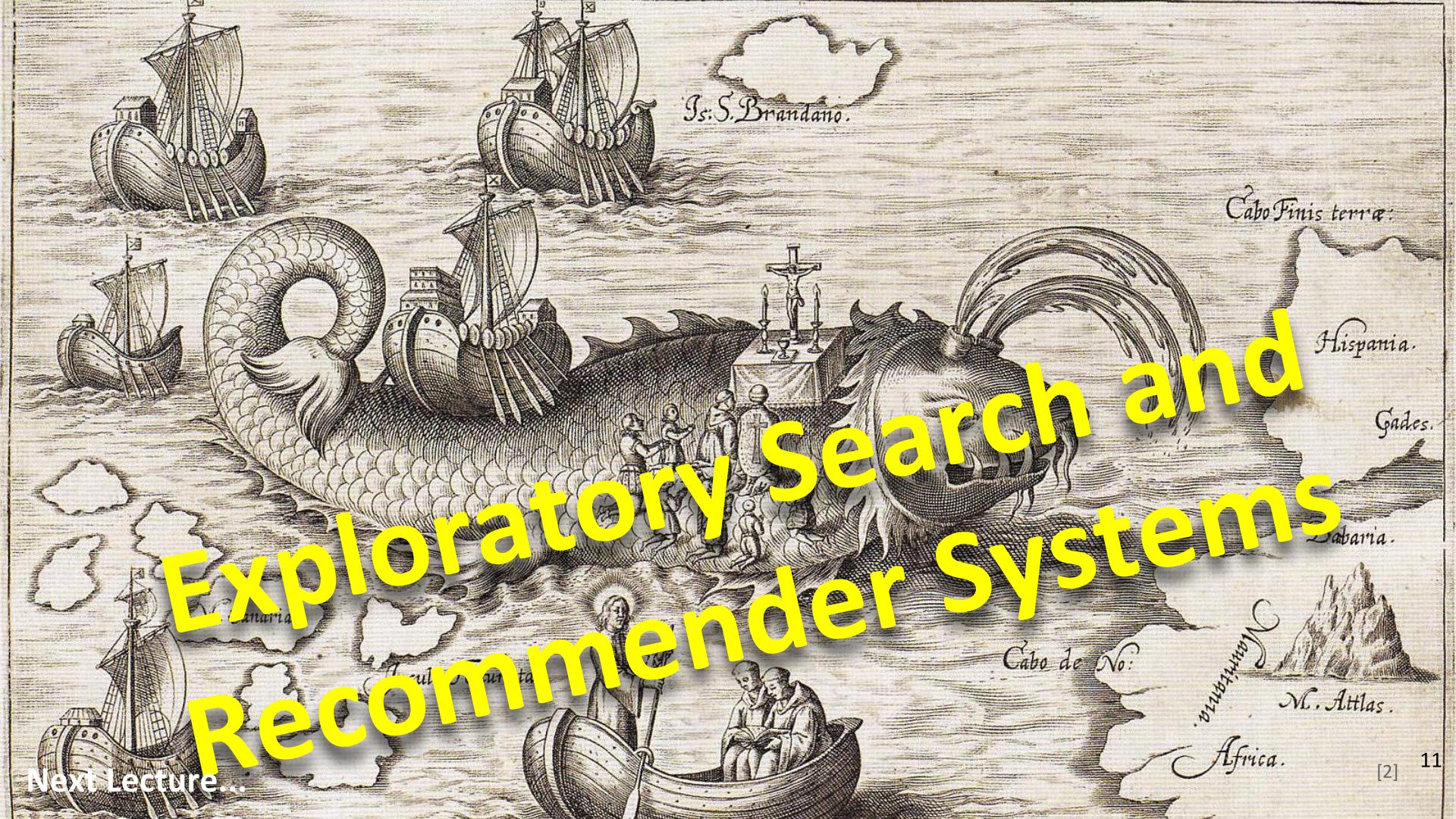


Exploratory Search and Recommender Systems

Next Lecture...

[2]

11



Knowledge Graphs

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