BIOfid: Accessing legacy literature the semantic (search) way

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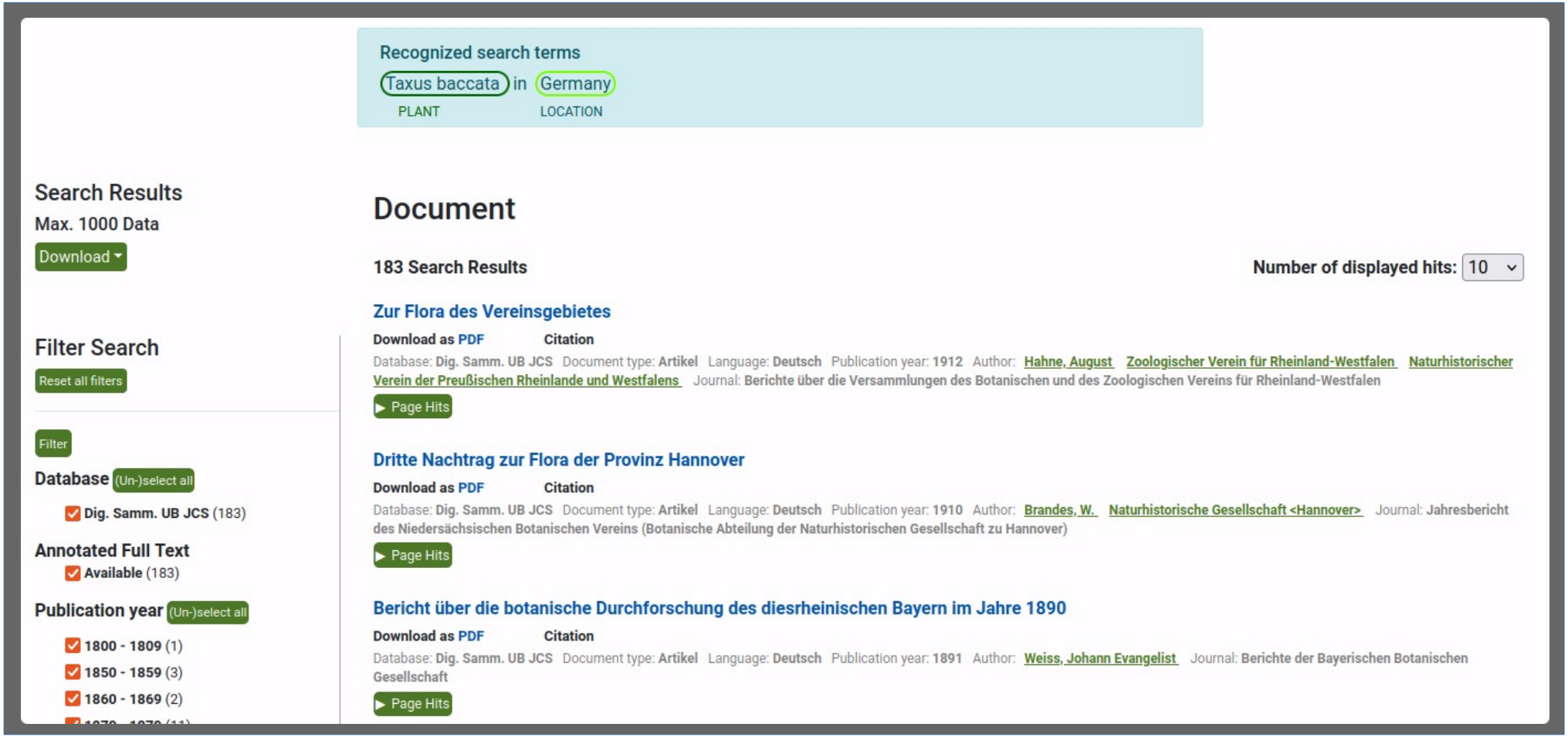
Frankfurt University Library, Germany
UB Labs

The BIOfid Project

https://www.biofid.de

- Since 2017 funded by the DFG
- Text-Annotation and Text-Mining of legacy biodiversity literature (in German)
- Focus taxa: Vascular Plants, Butterflies, and Birds
- Tools
  - Text-Annotation (Demo)
  - Bio-Ontologies (Link)
  - **Semantic Search on Documents** (Link)


Recognized search terms
Taxus baccata in Germany
PLANT
LOCATION
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Max. 1000 Data
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Database (Un-)select all
Dig. Samm. UB JCS (183)
Annotated Full Text
Available (183)
Publication year (Un-)select all
1800 - 1809 (1)
1850 - 1859 (3)
1860 - 1869 (2)
Document
183 Search Results
Number of displayed hits: 10
Zur Flora des Vereinsgebietes
Download as PDF
Citation
Database: Dig. Samm. UB JCS Document type: Artikel Language: Deutsch Publication year: 1912 Author: Hahne, August Zoologischer Verein für Rheinland-Westfalen Naturhistorischer Verein der Preußischen Rheinlande und Westfalens Journal: Berichte über die Versammlungen des Botanischen und des Zoologischen Vereins für Rheinland-Westfalen
Page Hits
Dritte Nachtrag zur Flora der Provinz Hannover
Download as PDF
Citation
Database: Dig. Samm. UB JCS Document type: Artikel Language: Deutsch Publication year: 1910 Author: Brandes, W. Naturhistorische Gesellschaft <Hannover> Journal: Jahresbericht des Niedersächsischen Botanischen Vereins (Botanische Abteilung der Naturhistorischen Gesellschaft zu Hannover)
Page Hits
Bericht über die botanische Durchforschung des diesrheinischen Bayern im Jahre 1890
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Citation
Database: Dig. Samm. UB JCS Document type: Artikel Language: Deutsch Publication year: 1891 Author: Weiss, Johann Evangelist Journal: Berichte der Bayerischen Botanischen Gesellschaft
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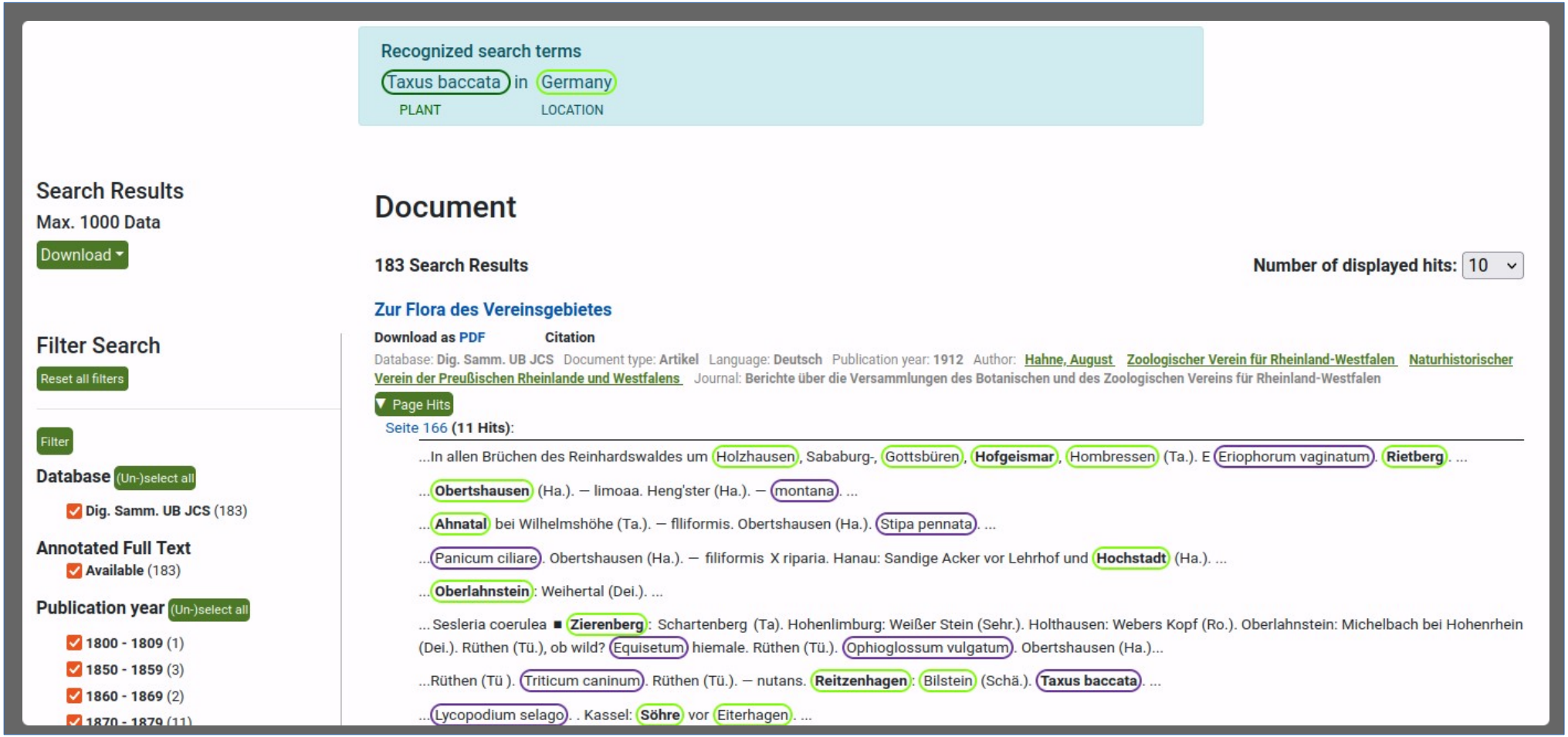
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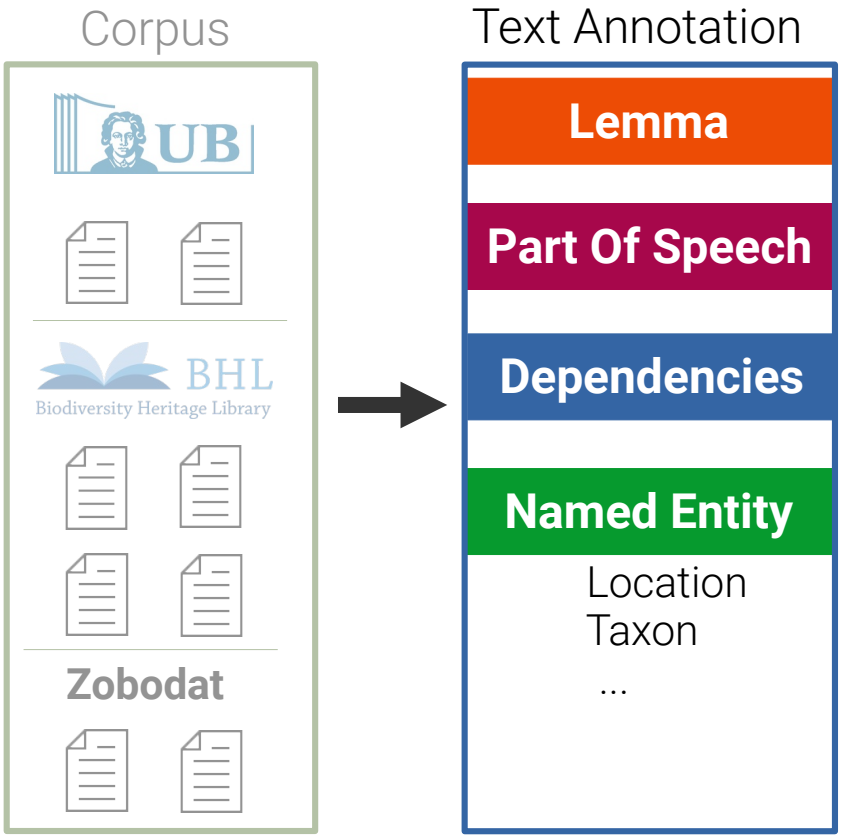
Forging Data

BIOfid Annotation Workflow

File Icon by Dario Ferrando

BIOfid Annotation Workflow



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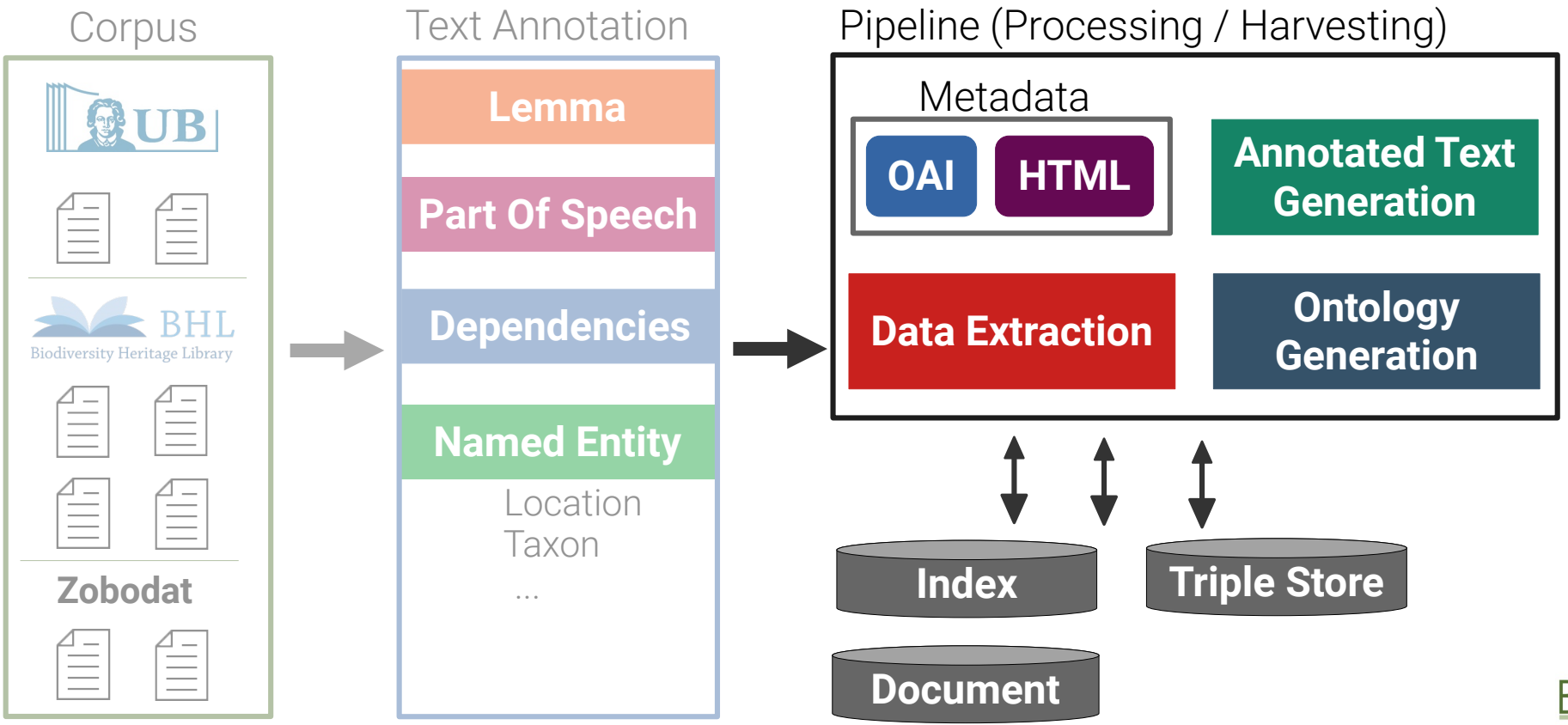
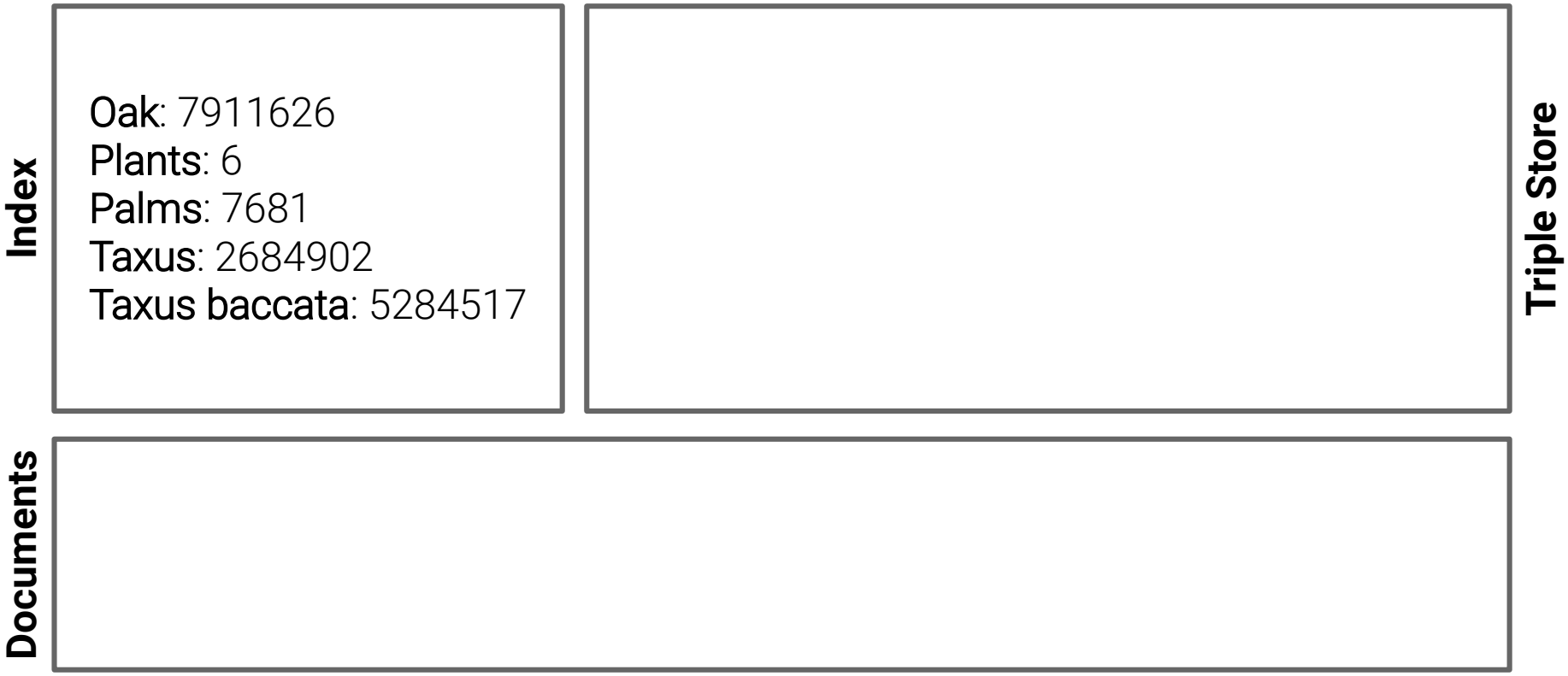
BIOfid Annotation Workflow



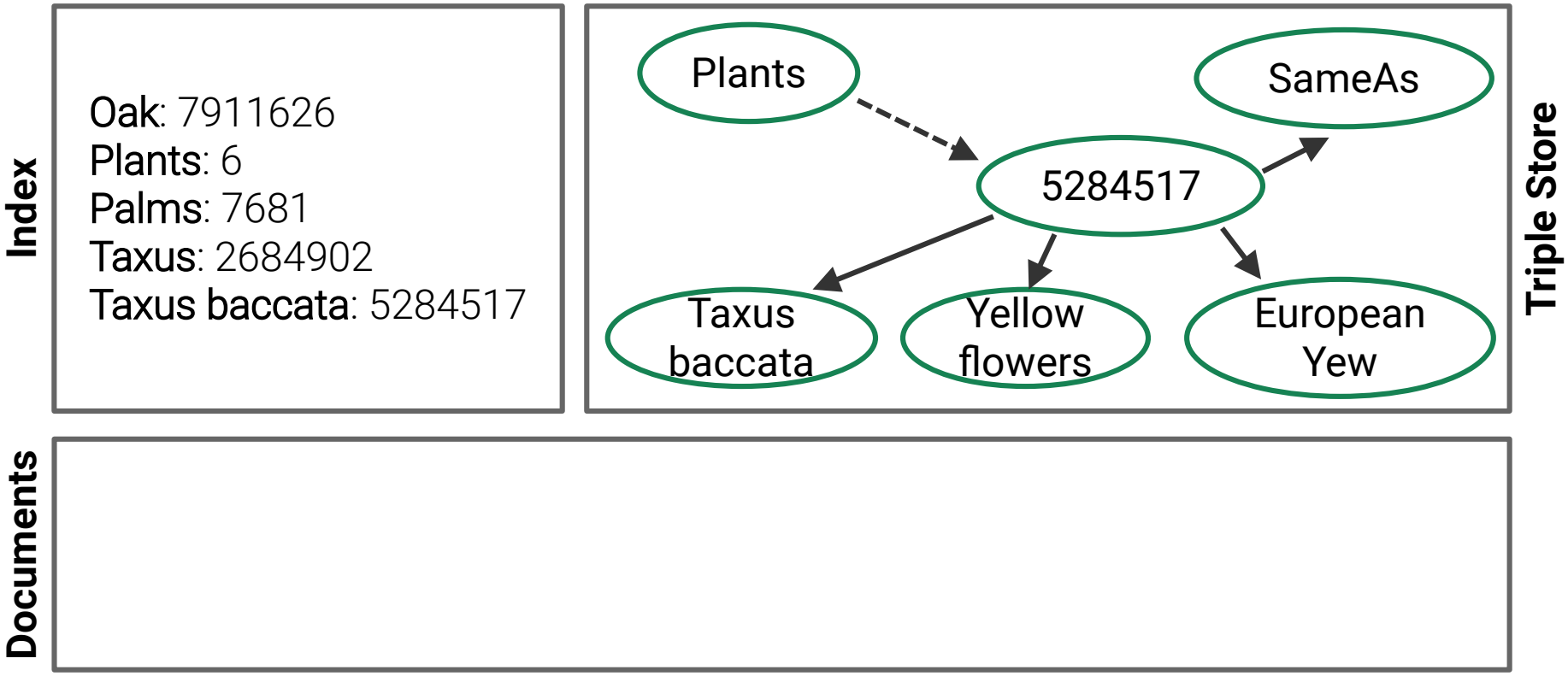
File Icon by Dario Ferrando

Linking the Data



Spoiler: The IDs are URIs, but let's make this simple.

Linking the Data



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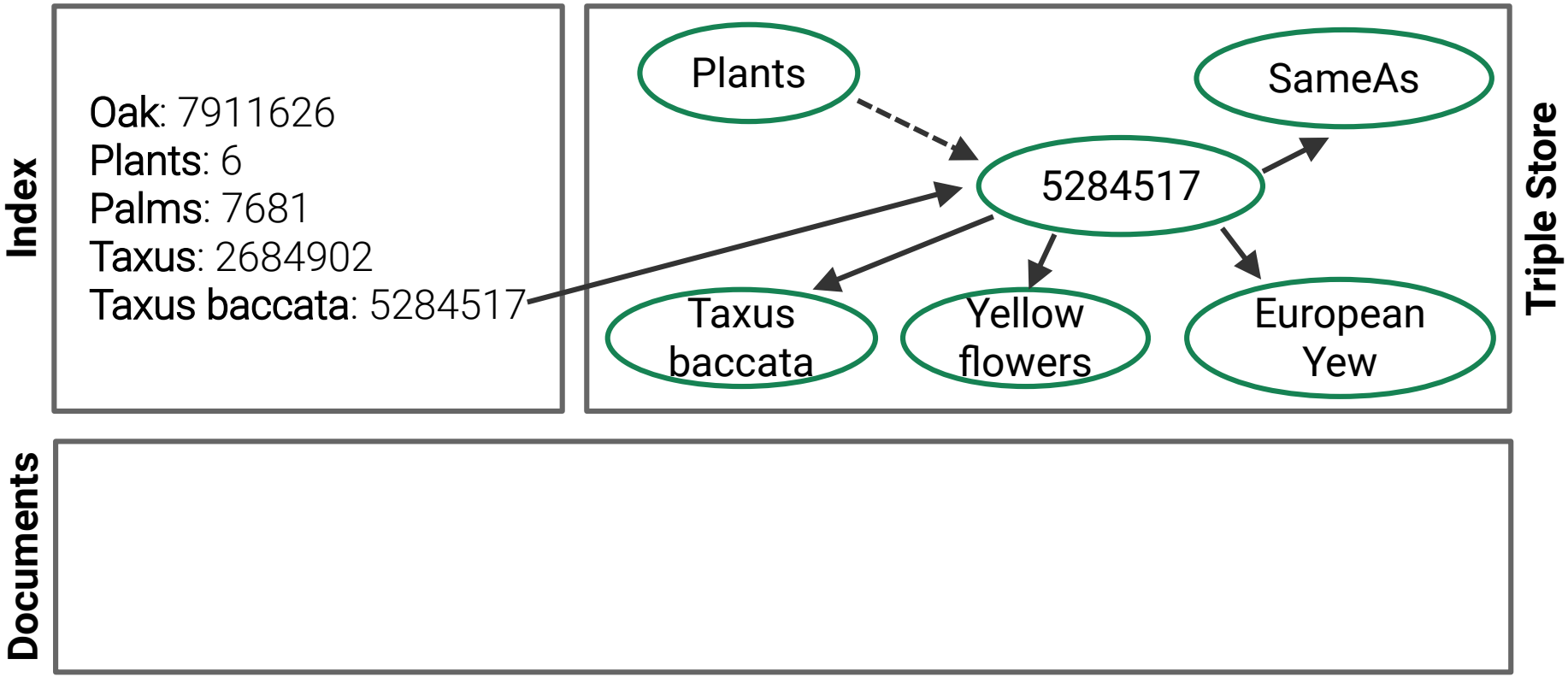

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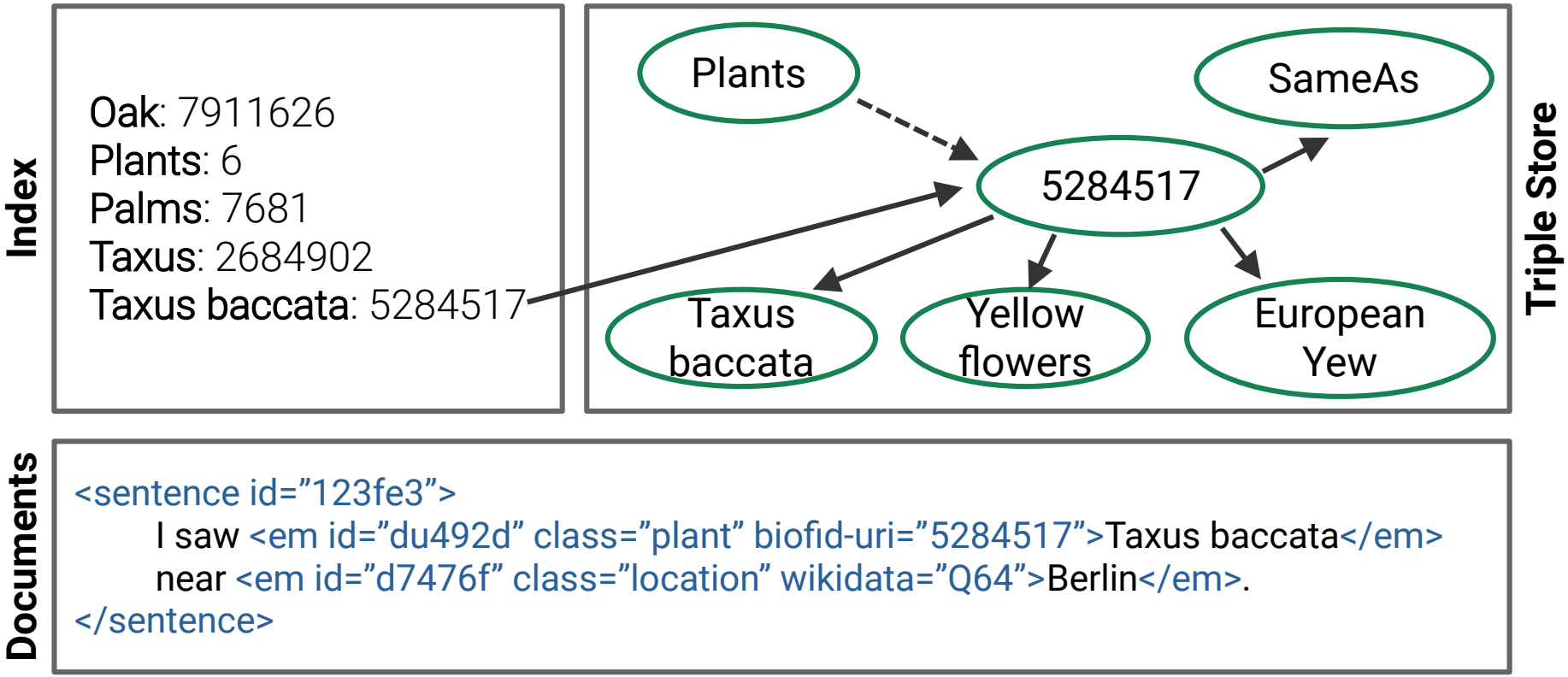

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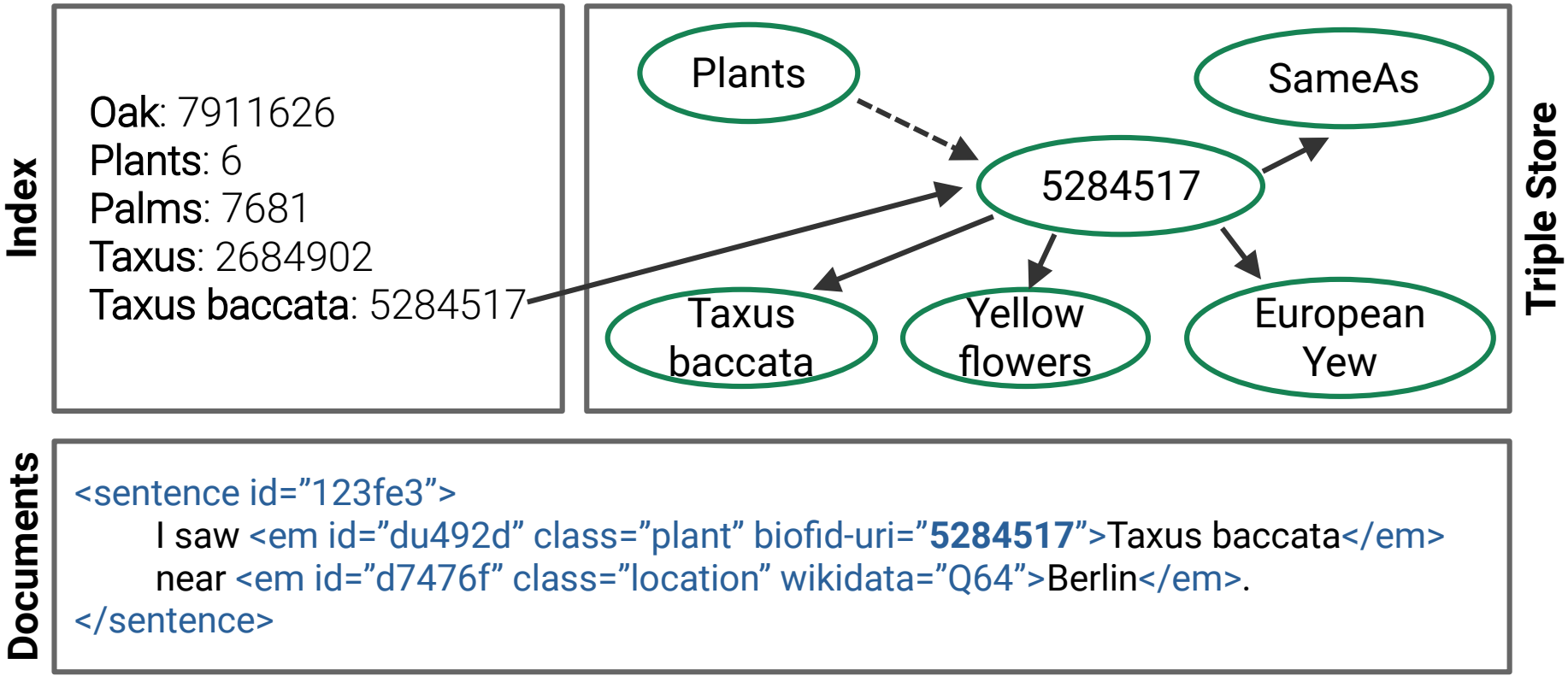

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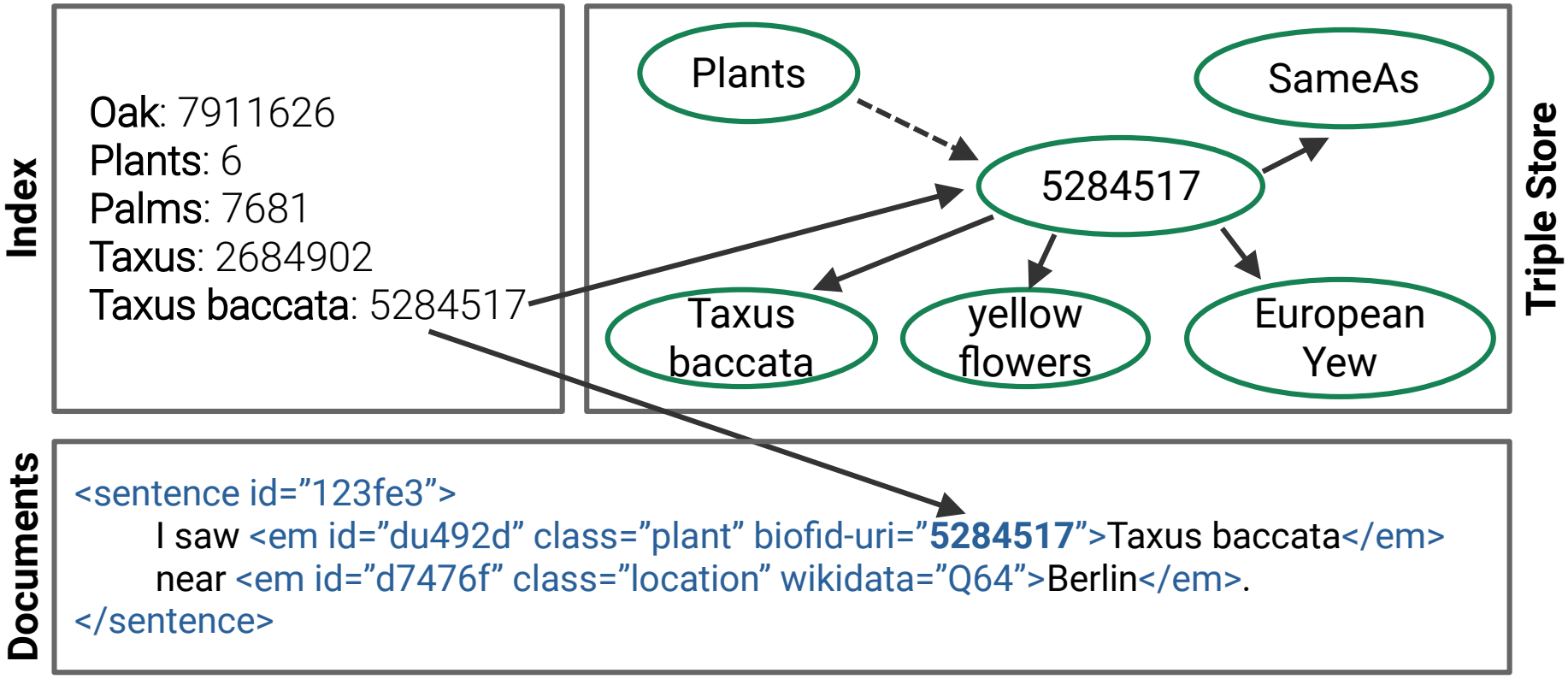

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Getting the Data out

The BIOfid Semantic Search Engine

Query Analysis

Plants with yellow flowers

The BIOfid Semantic Search Engine

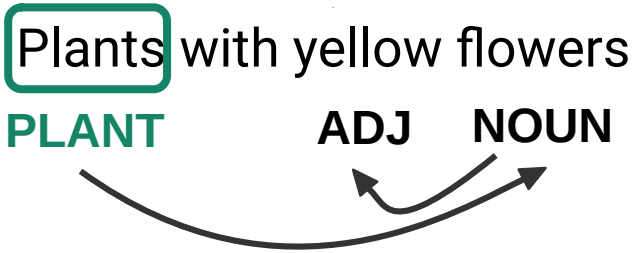
Query Analysis

Plants with yellow flowers **Natural Language Processing**

PLANT **ADJ** **NOUN**

The BIOfid Semantic Search Engine

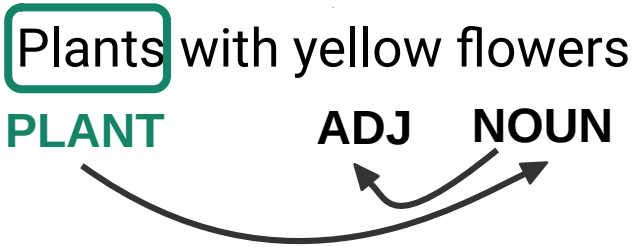
Query Analysis



Natural Language Processing

The BIOfid Semantic Search Engine

Query Analysis



Natural Language Processing

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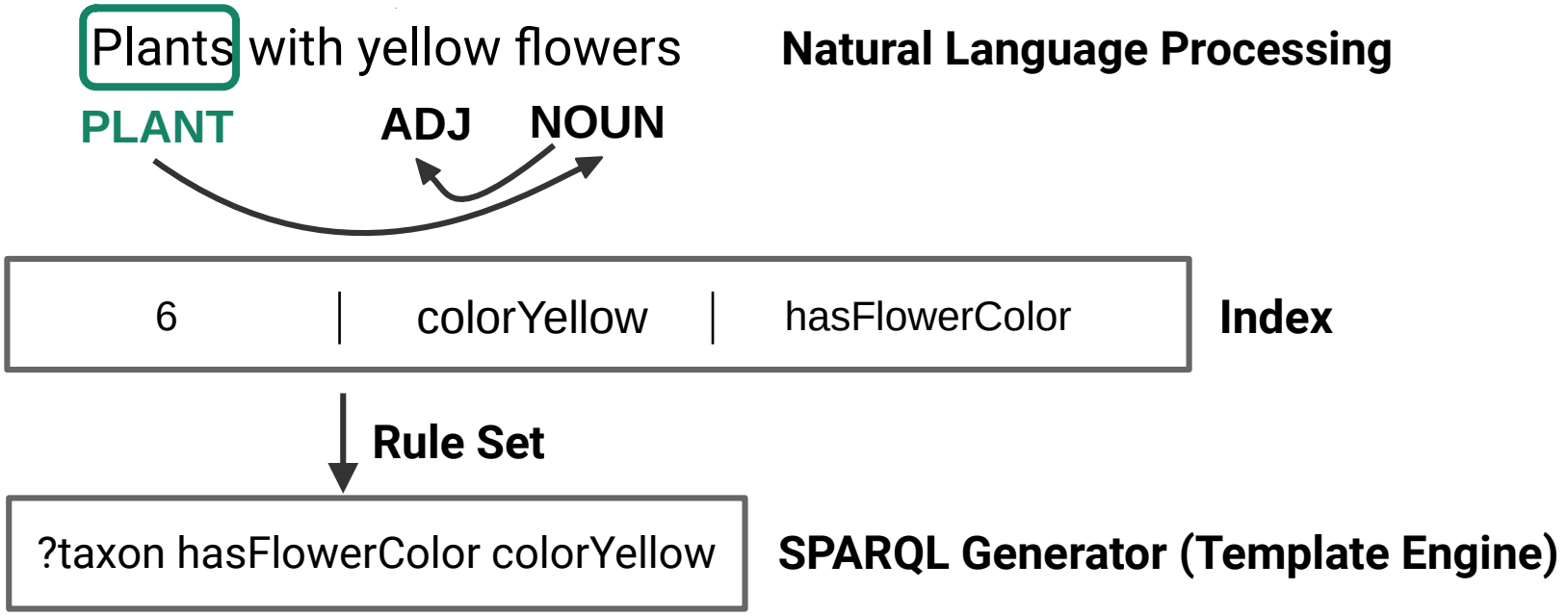

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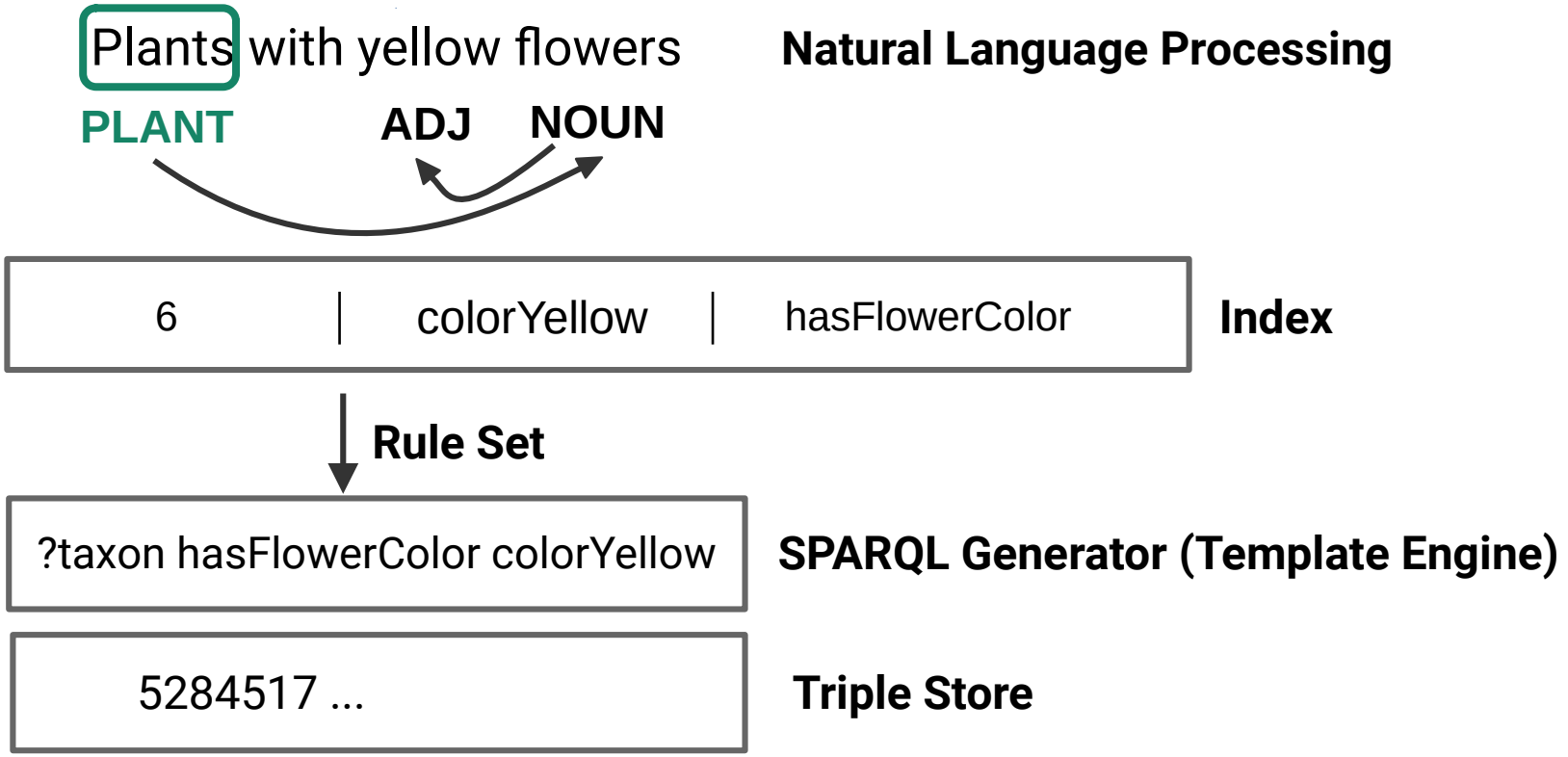

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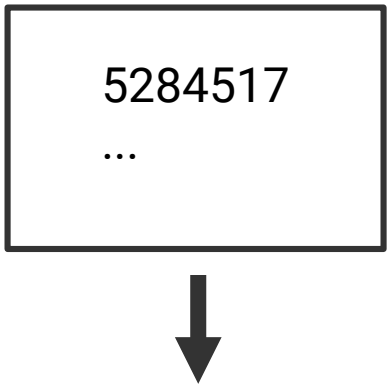
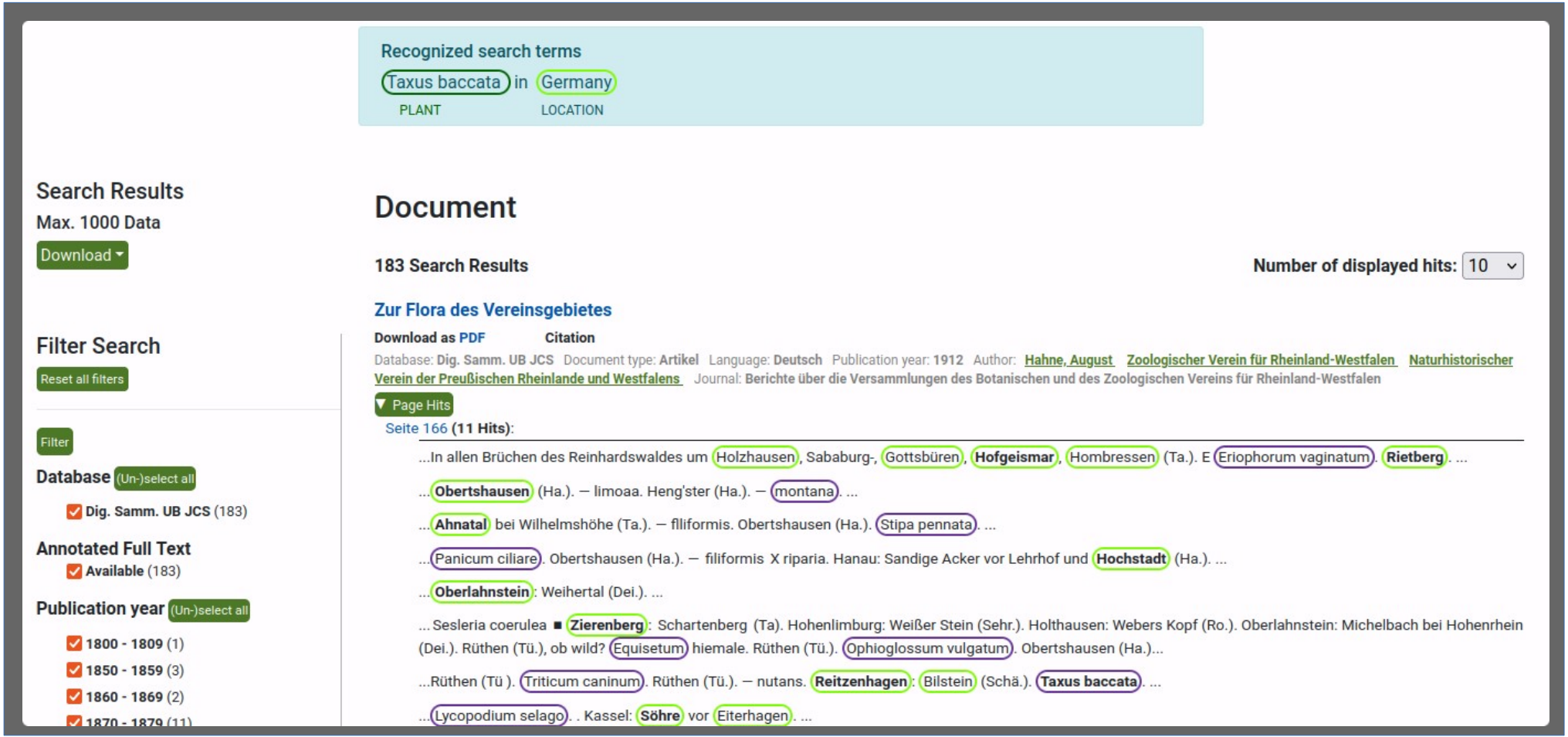
Getting the Documents

Triple Store Response



Documents

```
<sentence id="123fe3">
    I saw <em id="du492d" class="plant" biofid-uri="5284517">Taxus baccata</em>
    near <em id="d7476f" class="location" wikidata="Q64">Berlin</em>.
</sentence>
```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Lessons learned

- Store each NLP enrichment state of the user query

  You may need the data in some later (code) expansion

- Prefer templates for query interpretation over rules

  The query space is smaller than you think! Example: Lango

- Get ahead of drowning in data

  Can the application handle large (!) amounts of database responses?

- Do not underestimate the power of normalized data

  It creates a semantic context in your document database out-of-the-box

Alternatives

- Topic Modelling

  Latent Semantic Analysis, Latent Dirichlet Allocation, …
  May not scale well
  Some algorithms may be hard to parametrize

- Machine Learning

  Getting the training data is hard.
  Re-training every time the ontological knowledge changes (?)

Disclaimer: I applied neither of these approaches myself!

Information Extraction

Work in Progress

```
<sentence id="123fe3">
    I saw <em id="du492d" class="plant" biofid-uri="5284517">Taxus baccata</em>
    near <em id="d7476f" class="location" wikidata="Q64">Berlin</em>.
</sentence>
```

```
<SimpleDarwinRecord>
    <dwc:taxonID rdf:resource="5284517"/>
    <dwc:locationID rdf:resource="https://www.wikidata.org/Q64"/>
    <dwc:associatedReferences rdf:resource="doi:10.1234/789"/>
</SimpleDarwinRecord>
```

#Nanopublications

Thank you!

- **UB Labs Blog:** https://labs.ub.uni-frankfurt.de
- **BIOfid GitHub Repos:**
  - General: https://github.com/FID-Biodiversity
  - Harvesting large document facilities: LiteratureCrawler
  - Indexing annotated texts to Solr: TaggedTextTokenizer

Appendix

The BIOfid Semantic Search Engine

Query Analysis (Alternative)

Taxus baccata in Germany

The BIOfid Semantic Search Engine

Query Analysis (Alternative)

Taxus baccata in Germany

PLANT **LOCATION**

Natural Language Processing

The BIOfid Semantic Search Engine

Query Analysis (Alternative)